MOTOR AGE

Vol. XXXIII
No. 12

CHICAGO, MARCH 21, 1918

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Editorial Contents—Page 3

Advertisers' Index—Next to Last Page

In This Issue—The Spring Overhauling

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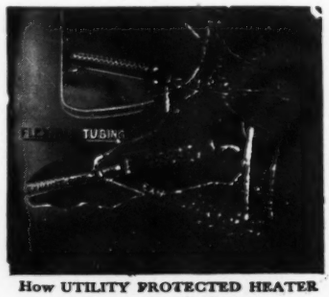

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Vol. XXXIII Chicago, March 21, 1918 No. 12

Contents

SPRING OVERHAULING 5
THREE AIR INVESTIGATIONS..... 11
EDITORIAL 14
Now for That Overhauling—A Maryland Monstrosity—War's Wear on Roads—Give the Bearings a Chance.
WHO'S WHO IN WAR ORDERS..... 20
STORE STAGES ACCESSORY SHOW..... 22
NEW RECORDS FOR ASCOT..... 23
WAR IN THE AIR..... 24
U. S. A. MOTORCYCLE FOR WAR..... 28
AKRON-CLEVELAND EXPRESS 30
TALES OF THE ALLEY RATS—No. 5..... 32
ELECTRICAL EQUIPMENT OF THE MOTOR CAR 34
NEW FRENCH TRACTOR DESIGNED..... 36

DEPARTMENTS

READERS' CLEARING HOUSE..... 38
ACCESSORY CORNER 44
MOTOR CAR REPAIR SHOP..... 46
AMONG THE MAKERS AND DEALERS..... 47
FROM THE FOUR WINDS..... 48

COMING

Have you marked April 4 as a red letter day on your calendar? MOTOR AGE'S annual touring issue will bear this date this year, and you should be interested in everything that number will contain. The objective points this year are the training camps of the Army and Navy. The main routes leading to them, provisions for your car there and much other practical information will be given April 4. Help conserve transportation by using your car for such trips this year. MOTOR AGE will help you.

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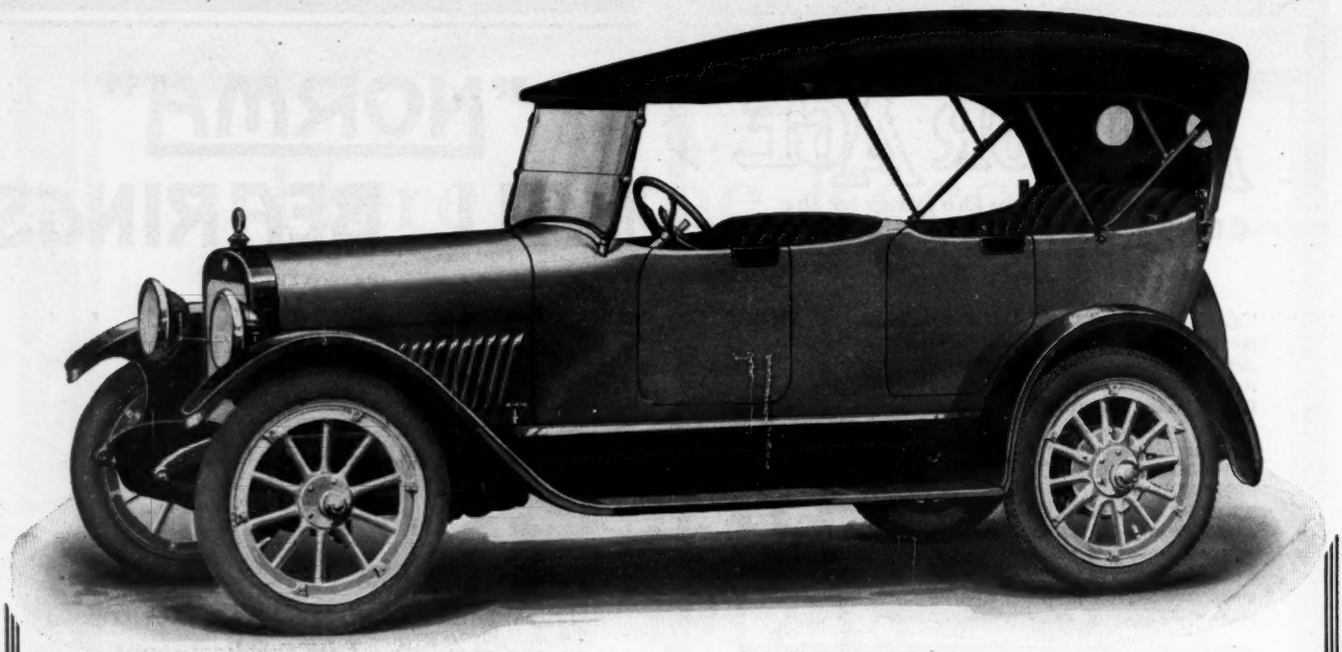

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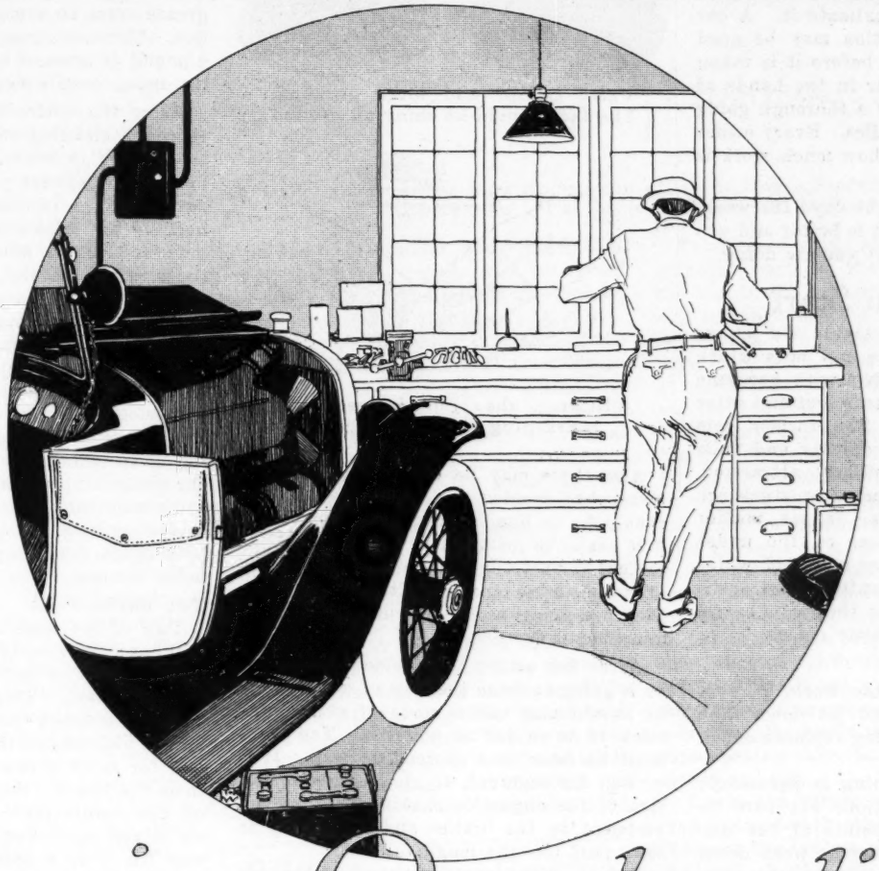


Spring Overhauling

By B. M. Ikert
Motor Age Editorial Staff

Steps 1-7

1. Notebook in hand, go over car and jot down parts needing:
   (a) Replacement.
   (b) Repair.
   (c) Adjustment.
   (d) Close inspection.
   (e) New Fitments.
2. Kerosene on rusted nuts.
3. Put car on horses.
4. Remove: (a) Fenders.
   (b) Wheels.
   (c) Sod pan.
5. Thorough cleaning of car.
6. Thorough cleaning of garage.
7. Lay out your tools.

Steps 8-21

8. Engine in general.
9. Gasoline system.
10. Lubricating system.
11. Cooling system.
12. Ignition system.
13. Clutch.
14. Gearset.
15. Rear axle and universals.
16. Brakes.
17. Steering gear and front axle.
18. Springs.
19. Electric system.
20. Tires.
21. Top and upholstery.

SPRING, the accepted time of the year for overhauling and cleaning up, is here again and owners are beginning to put their cars in commission. Some have been run all winter; others have been safely tucked away in an unheated garage. Both need attention.

Motor car overhauling consists essentially of a general cleaning of all the car's components, tightening up here and there, adjustment, inspection and, in a great many cases, replacement of worn parts. To many, overhauling is an annual affair and the longer a man owns a car the better he knows how to go about the work. Adjustments vary with different cars, but essentially the construction and arrangement of engine, gearset, rear axle, etc., are pretty much the same in all cars, and a general rule for overhauling applies in nearly every case.

Present-day cars will give good service if the care and attention they need is administered properly by the owner. Maintenance means more than merely filling the radiator with water, the tank with gasoline or the engine with clean oil. Although the modern car is as fool-proof as it is possible to make any piece of machinery, it should be borne in mind that any mechanism subjected to strains and stresses like a motor

car demands care, and some knowledge on the part of the owner to keep it working up to its maximum efficiency.

Just how much work is necessary naturally will be governed by conditions. A car comparatively new needs usually but a good cleaning, with perhaps a few minor adjustments on engine or chassis. The older a car, the greater the chances of bearing replacement, new gears, pistons, etc. The time at which a general overhauling is advisable varies so much in individual cases it is hard to approximate it. A car given the best of attention may be good for 40,000 miles or more before it is taken down, while the same car in the hands of a neglectful owner needs a thorough going over at the end of 5000 miles. Every owner must decide for himself how much work is needed.

If possible, select bright days for working on the car. The light is better and you can see more readily what you are doing.

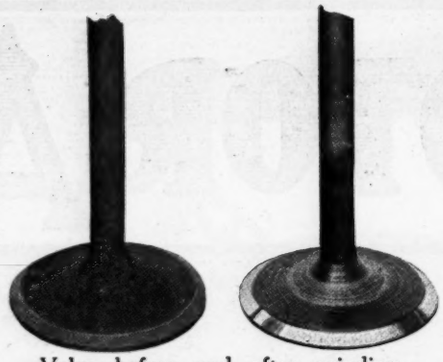
Before You Start

The night before you tackle the job go out and give those bolts and nuts which look rusty a good soaking with kerosene and oil. Apply the kerosene first and after a time apply the oil. The former gets through the joints more quickly and pulls the oil after it by capillary attraction. The bolts likely to be rusted or stuck are those on the exhaust pipe flanges, muffler fastening bolts and others on the under side of the chassis, where mud and water get in their work. By treating these obstinate nuts in this manner they can be removed easily when the time comes.

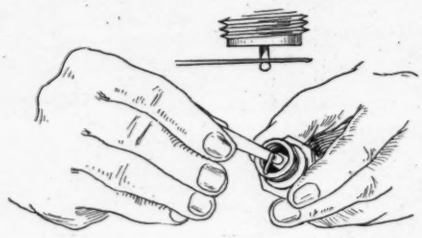
Make Notes

Before doing any of the work, go over the whole mechanism and jot down in a note book the parts needing replacement or repair.

Perhaps new brake lining is necessary; the rubber hose connections are sure to need replacement; the points of the distributor or interrupter may be worn down to such an extent that new ones are necessary. In the same way other items may be needed and so far as possible these all should be on hand when the great job of cleaning up begins.



Valve before and after grinding. The face should be shiny all around



Adjusting the gap between the spark plug points by a gage

Also there may be certain fitments the owner has decided to add this year; these should be on hand likewise, for sometimes it is easier to install such accessories when the car is partially dissembled and if they are not on hand it is difficult to tell whether they are going to fit without a little trimming here and there.

After the owner has decided just what he is going to do in the way of overhauling he should map out a mode of attack and stick to it so far as possible. The work must be done in a systematic way. It is wrong, for instance, to clean a small portion of the engine or chassis, make an adjustment on the brakes and then jump to some part like the magneto.

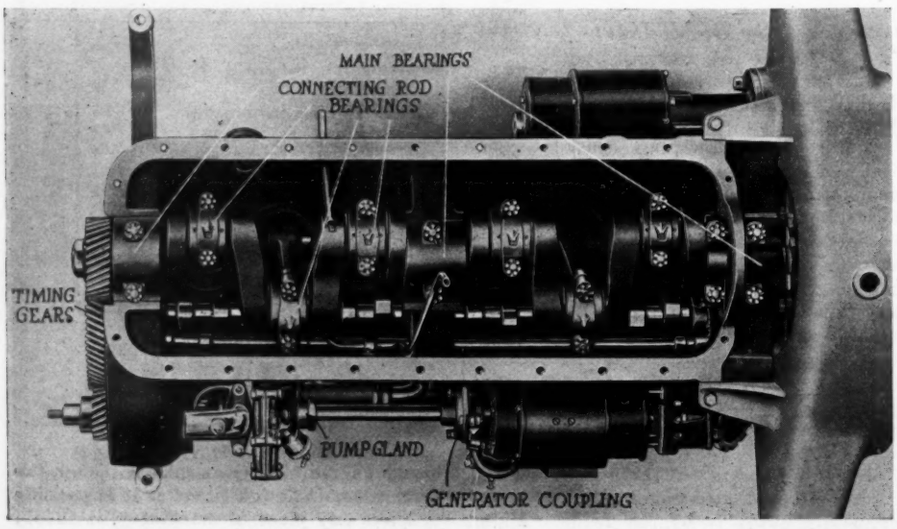
Before doing any dismantling the car should be given a good cleaning, washing off all mud and grease from the exterior parts. To facilitate the work, the fenders can be taken off, and if there is not a pit in the garage it would be better to place the car on four supports, elevating it somewhat. This allows you to get underneath and also makes it possible to remove the wheels. Take off the sod pan from under the engine. The latter, with fenders, running gear and body, then should be washed. The bulk of the mud and grease will be on the chassis and under part of the fenders. It can be removed by playing on the parts with a hose from which the nozzle has been taken off, using clear, cool water. The grease must be removed with a soap solution. The latter can be made by dissolving a pound or more of soap in a gallon of water, using castile soap.

After the entire car has been given a thorough cleaning sweep the floor and put the garage in order. Clean off the work bench and examine your tools for defective cutting edges on chisels, etc. Grind those needing it. Also provide several boxes of various sizes to hold the engine and car parts, such as the carbureter, magneto, pump, etc. This does not mean that all the bolts and nuts removed are to be put in boxes. The best way to do with them is to put them back into their respective holes after the parts are dissembled. For instance, if you take the generator off the bracket on the crankcase, screw the holding down cap screws back into the base of the generator, putting the washers on the same way they were taken off. This will insure getting the parts correctly assembled again, besides preventing loss of the bolts or nuts.

Two Useful Tools

Two of the most useful tools the owner will have occasion to use are a hammer and prick punch for marking the parts before their removal. This is necessary to get them assembled properly again. Many do not understand this method of marking and for those a few words here will give them the knack. Suppose you were to take off the connecting rod caps and got them all mixed up. You could not tell which was No. 1 or 4 and even if you did you might bolt it on in reverse of what it was before. To guard against this a prick punch mark is made on the connecting rod and also the cap. For No. 1 rod a single punch is made, for No. 2, two, and so on. The marks are made on the same side of the rod, thus when the cap is put in place again the owner knows it is on the way he took it off. Timing gears are marked in the same way, so retiming the engine becomes a simple matter.

See that you have on hand all the tools and equipment mentioned on page 7 and you are ready to go on.



Bottom view of engine, showing bearings which may need adjusting, generator or magneto coupling, pump gland, etc.

Tuning Up the Engine

Most important of all the units is the engine and as the greater amount of work will be confined to it, it should be gone over first. Clean the exterior with kerosene thoroughly, using a stiff brush and old paint brush to get in the corners. Drain the crankcase of all oil and put in plenty of kerosene, screwing back the drain plug. Turn the engine over about twenty or thirty times and drain off the kerosene.

Next take off such parts as the carbureter, plugs, manifolds, generator and magneto, being careful in the latter case to put

prick punch marks on the coupling and shaft so the timing will not be thrown out upon reassembling. Take the radiator off also. This gives you free access to the engine.

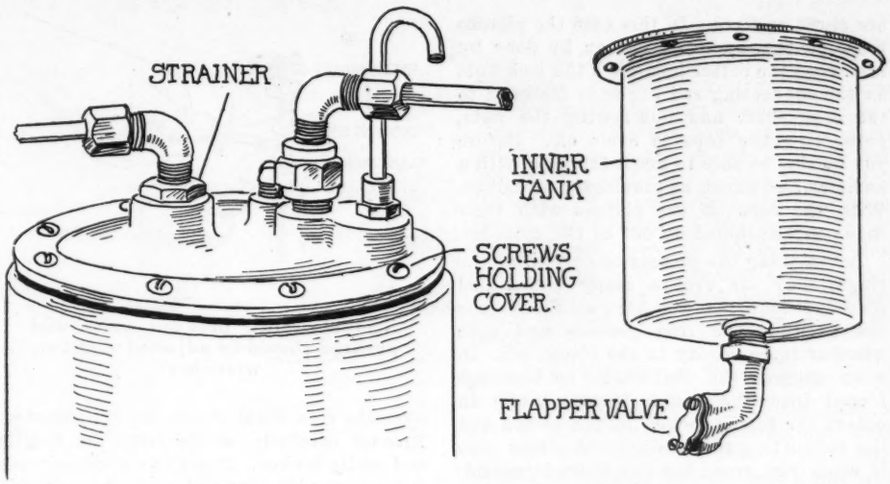
Before taking down the engine it would be well to run it for a short while to test for compression, etc. A rubber hose can be slipped over the crankcase filler tube and while someone turns the engine over by hand, another person listens at the other end of the hose. If hissing sounds are heard it shows the gases are leaking past the rings, or the valves are not properly seating, if the hose is connected to carbureter air intake. Test the tension of the valve springs while the engine is running. This is shown in the illustration and is carried out by inserting a screwdriver in the valve spring, giving it a slight twist to increase the tenison. If the engine picks up in speed it shows the spring is too weak and a new one should be substituted. The springs are cheap, and it is better to replace all of them.

Grinding the Valves

Valve grinding always has been, and probably always will be, one of the chief features of overhauling poppet-valve engines. It is not a difficult matter to grind in a set of valves, the hardest part being to get out the small pin placed under the cupped washer holding the spring. The latter must be compressed before the pin can be taken out and for this many forms of valve lifters have been brought out. While these are very handy and do the work well, the owner can make one out of an old mill file, as shown. The end simply is notched out to fit under the washer and a block of wood used as a fulcrum. To hold down the valves while the springs are compressed a wrench or similar object can be placed over them, being firmly held by a large washer and piece of pipe slipped under the nut on the cylinder head stud. Naturally the design of engine will determine the method that must be used. On T-head engines, for example, the plugs over the valves can be unscrewed and a small block of wood inserted, putting the plug in place again. Then when the spring is compressed, the valve stays down, being prevented from rising by the wood block. Valves placed in the cylinder head are easier to remove, because the whole mechanism is exposed when the head is taken off and there are no manifolds, etc., to get in the way of the valve-lifting tool.

In taking out the valves be sure to lay them down in proper order, so each one will be put back in the hole it was taken from. A good way to do this is to put a sheet of wrapping paper on the bench and divide it into sections marking them 1, 2, 3, and so on, up to the total number of valves. Then lay down all the parts belonging to No. 1 in section No. 1 and do the same with the others. Or, a prick punch mark can be put in the first valve, two in the second, etc. Some owners tie a small tag on the valve stem with proper markings on it.

Clean all the deposits of the cylinder head, piston, valves, top of cylinder block, etc. There will probably be crustations under the valve head as well as sticky deposits on the stems themselves. These all should be scraped off, and the valve guides cleaned out. If there is a great deal of play in the valve guides, they had better be reamed out and valves with oversized stems fitted. Or, if the guides are bushed, new bushings can be installed.



Stewart vacuum tank, showing location of the strainer, flapper valve and other parts. To get at strainer remove the locknut

Examine the valve seats and faces of the valves themselves to ascertain their condition. If they are but lightly pitted, regrinding will put them in shape again, but if they are ringed considerable, they must be refaced with a reseating tool. The latter cuts away part of the metal on the valve head until a perfectly flat surface is obtained, the job being finished by grinding in.

Valve grinding is a simple operation and requires, besides the paste, a screwdriver or valve-grinding tool to oscillate the valve back and forth. A brace fitted with screwdriver bit often is used and does the work very well. Grinding paste can be made by sprinkling a little emery flour in oil until the mass is in paste form. There are, however, grinding compounds on the market, affording a coarse paste for starting and fine for finishing. These should be used.

What to Have Ready

The car's kit of tools. In addition the following are handy:

- Socket wrenches.
- Files.
- Cotter pin puller.
- Brace and screwdriver bit.
- Valve lifter.
- Prick punch.
- Blow torch.
- Offset screwdriver.
- Rivet hole punch.
- Bundle of waste or rags.
- Kerosene and gasoline.
- Wire brush, also old paint brush.
- Spring leaf spreader.
- Wheel puller.
- Box of cotter pins, washers and nuts.
- Grease and oil gun.
- Sand and emery paper.
- Grease, clean oil and distilled water.
- Vulcanizer.
- White lead and shellac.
- String.
- Grinding compound.
- Spring, for valve grinding.
- Spool of soft wire.
- Tape.
- Hydrometer.
- Vaseline.

Take No. 1 valve and put a little of the grinding paste on the face, as well as on the seat in the cylinder block. Put a small coil spring under the valve head and drop it in place. The object of the spring is to raise the valve when pressure is removed. It makes the job much easier than when you have to reach under the valve and poke it up every time it needs turning. In grinding do not use a continuous rotary motion, but turn the valve a half turn or so, first in one direction, then the other. Remove the pressure occasionally, and as the valve lifts swing it to a new position. This prevents cutting rings in the seat. Bear down on the valve just enough to cause the paste to grind. Inspect the valve frequently and if the face looks bright as in the illustration, that one is finished so go on with the next, until all are ground. Do not grind any more than necessary. The more you cut away the lower the valve goes, and the less opening there will be for the gases to get in and out.

Leave the valves out for the time being and proceed with other parts of the engine. Remove the bottom plate on the crankcase, as well as the one covering the timing gears. This gives you a chance to examine the connecting rod, main and camshaft bearings, as well as other interior parts. Play in the bearings generally is brought to light by noisy action of the engine. Main bearing wear is characterized by a dull thumping sound, while worn connecting rod bearings frequently give off a distinct tapping sound that increases with the speed. Frequently one can tell by feel whether or not the bearings are worn. If entirely new ones are necessary, it is better to let a competent repair man do the job, as most owners are not capable of this work.

Removing Powerplant

If a thorough overhauling is necessary on the powerplant it would be best to remove it from the frame and get it on a suitable stand or bench of some kind. This means disconnecting all connections on spark and throttle, manifolds, driveshaft, etc. However, most engines now are made so that practically any work the average owner is likely to do on them can be performed while the powerplant is in position.

If you have tested the compression previously to overhauling and foud it weak in one or more cylinders, it may be the rings

are stuck or worn. In this case the pistons must be taken out. This can be done by removing the cotter pins from the lock nuts on the connecting rod big ends fastened to the crankshaft and unscrewing the nuts, permitting the caps to come off. Before you do this be sure to mark the caps with a hammer and punch as previously described. With the caps off the pistons with their rods can be slipped up out of the cylinder.

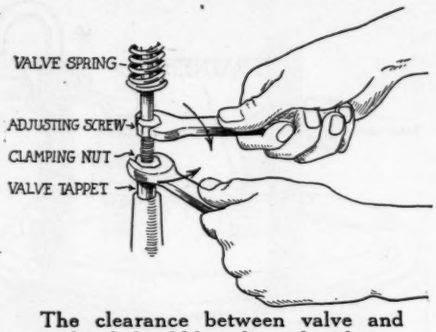
In removing the pistons be careful of the rings; they are broken easily if handled roughly. Now that you have all the pistons out examine the ring grooves and note whether there is play in the piston pin. In some engines the pin works in bushings forced into the piston bosses, while in others the pin is locked in the piston and the connecting rod bushed. In either case if when you grasp the rod there is considerable play, the pin or bushings need replacement. Do not be misled by the lateral play of the rod in the piston. This is necessary and should not be mistaken for wear.

Double-ended Wrench

Sometimes when the piston pin locking screw is to be removed it cannot be reached easily unless a socket wrench is used. In this case if you have a common double-ended wrench, place it down into the piston on the screw head and grip the other end with a monkey wrench. This in most cases will turn out the screw.

Should the pistons and rings be of a rather dark color it shows the latter are not tight. On the other hand, if they are shiny it shows they have been rubbing against the cylinder walls and are therefore in good shape. As long as you have the pistons out you might as well clean the ring grooves. This will prevent the rings from become stuck.

To remove the rings proceed as follows: Cut several strips of metal about ¼ in. wide and 3 or 4 in. long. Slip one of these under the first ring at the joint and work it around under the ring to a point on the opposite side from where it was inserted. Proceed carefully, as the rings are fragile and easily broken. Place two or three more strips under the ring and work them around to various points until you have the ring free of the groove. Then with the fingers of both hands work the ring up on the metal guides until it slips off. Work the ring up evenly so it will not break when it snaps out of position. Clean the grooves with an old chisel and finish with a wire brush dipped in kerosene. When all have been cleaned put the rings back into the grooves, getting each one into the groove it was taken from. Oil them well and rotate them to make sure all foreign matter has been removed.



The clearance between valve and pushrod should be adjusted with two wrenches

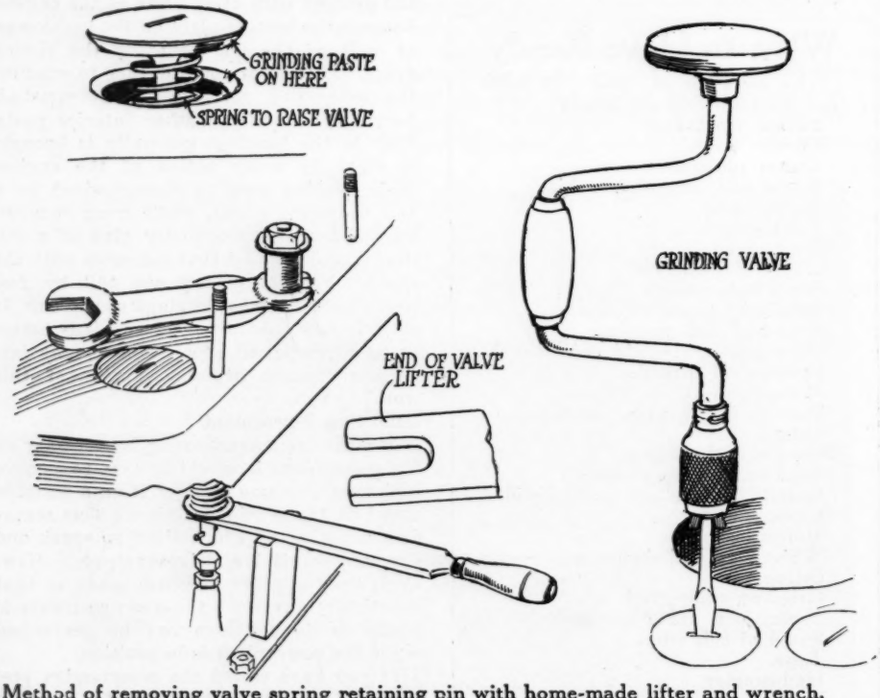
Now for the bearings. With the pistons out you readily can determine any shake in the crankshaft or camshaft bearings. If those of the latter are worn they should be replaced. As a rule the camshaft can be removed by loosening set screws on the side of the crankcase which hold the bearings in place. To facilitate matters raise the pushrods to their highest point and slip a nail or cotter pin through the hole in the rod to hold in on the guide. Then the camshaft, with timing gear and bearings, is slipped out as a unit. This does not hold with every engine, but a little study will reveal how the camshaft can be removed. Before slipping out the camshaft, make sure the timing gears are marked so they can be remeshed correctly. The chances are they will be marked by prick punch marks on the teeth, but if they are not it is an easy matter to do so.

If the main bearings need adjustment, the engine by all means should be taken out of the car and placed in an inverted position, as shown in the illustration. Then with the bottom half of the crankcase removed you can get at the bearings easily. To adjust the main bearings take off the babbitted caps shown in the illustration and clean the bearing surfaces with kerosene. Apply a little red lead or Prussian blue to the bearing surfaces and replace the rear cap. Draw it down as tight as possible and if the cap is fitted properly the crankshaft should be able to be turned with one hand. If it turns too easily the cap must be removed and the steel surface of the cap filed off slightly to bring the bearing surfaces closer together. Where liners are used it is sometimes necessary to remove but one of these, which amounts to the same thing as filing the caps.

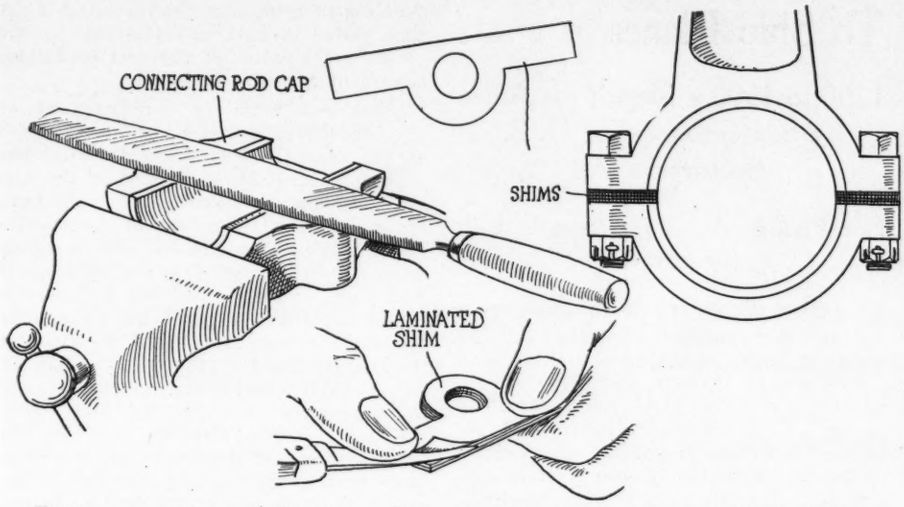
Observe Markings

After removing the caps observe whether there are any red or blue markings that would show the shaft to have an incomplete bearing length on the cap. The spots of color indicate the hollow; thus the high spots have to be removed. The latter will be shiny. To do this, scrapers are used and only a little metal must be removed at a time, putting back the cap and trying again with the color. All the main bearings should be gone over in this way and the surfaces cleaned out thoroughly with gasoline. Then put some lubricating oil in the bearings and draw up the caps as tightly as possible, with the necessary shims in place, of course. There is no danger of getting the bolts too tight so long as you put a film of oil between the crankshaft and bearings. Be sure to put cotter pins in the castellated nuts to anchor them.

If the engine has been taken out it can be replaced now, as it will not be so heavy. When the holding-down bolts are in place you can put back the pistons and rods. Be sure to smear plenty of oil on the walls of the cylinders, which should have been wiped free of the old lubricant when the pistons were taken out. In replacing the pistons some way must be devised to compress the rings, as they will stick out and strike against the cylinder block. Some owners prevent this by wrapping a piece of soft wire around the ring and twisting the ends together. Then when the piston slides in the bore the wire is slipped off after the ring is part way in the cylinder. There are on the market ring compressors which do the work very nicely and these cost but a few cents. When the piston is dropped in place the connecting rod can be pulled down on the crankshaft and the bearing cap replaced. If the bearing needs adjustment the same procedure is carried out as that for the main bearings. Most engines now are provided with laminated shims on the connecting rod ends. These consist of several layers of thin material which can be separated with a knife, as shown. The layers are torn off like sheets of paper from a desk pad. They can be obtained for



Method of removing valve spring retaining pin with home-made lifter and wrench. Brace and screwdriver bit for oscillating the valve



Fitting connecting rod bearings. In some cases the cap must be filed. With laminated shims they can be peeled off

Ford, Chevrolet, Maxwell, Overland and Dodge Brothers cars and also for Continental engines, models 7-W and 7-N.

To make proper adjustment simply remove one or more shims from each side of the connecting rod cap. Be careful not to draw up the bearings too tight. Where no shims are fitted, it is necessary to draw-file the connecting rod cap as shown in the illustration. Before putting the caps on the rods squirt oil on the bearing surface. If no lubricant is applied there is danger of the bearing melting out when the engine first is started up and oil has not been given a chance to get into bearings. Make sure that cotter pins are put in each side of the caps to lock the nuts.

Making Adjustment

While the valves and camshaft are still out you can test the pushrods. They should slide freely up and down in their guides, but if there is considerable side play, new guides are advisable. Worn pushrod guides are responsible to a great extent for noisy engine operation. If the pushrods let a great deal of oil get past them, it can be remedied by cutting a groove around the rod near the top and one or two grooves from this running lengthwise with the rod. The excess oil is caught in the annular groove and carried by the others down the rod and into the crankcase.

Put back the valves and camshaft, making sure the camshaft gear is timed correctly with the small one on the crankshaft. Where the front end drive is by chain, the same precaution is necessary. You now can put back the cylinder head and bottom plate on the crankcase. If the copper gasket of the former is not in the best of shape, fit a new one. As a rule when the joints of the crankcase and timing gearcase have been disturbed, new felt washers should be fitted. The old ones are oil soaked and never make as good a job.

Do not try to set the cylinder head nuts or studs up tight when the engine is cold. Draw them just sufficiently so they will be reasonably tight. Then, when the engine is started later on and allowed to get quite warm, go over all the nuts and bolts. You will be surprised how much you are able to turn some of them.

If very much reseating or grinding of the valves was done you will find the adjustment between the valve stems and tappets has been altered. This adjustment must be made when the engine is hot; therefore, leave it for the present. When the engine again is started, take two small wrenches and go over the adjustments, holding the adjusting screw with one wrench while the other sets the locknut. The manner of doing this is shown in one of the illustrations. Get the space the same for all valves; make a feeler consisting of a small narrow strip of metal shaped as shown, to go between the valve and tappet. The valves should not have more than $\frac{3}{32}$ in. or less than $\frac{1}{64}$ in. clearance. Naturally the best adjustment lies halfway between these two figures. The intake valves sometimes are given a little less clearance than the exhausts, because they do not expand as much.

Before you leave the engine for other parts go carefully over it to see if any lock washers, cotters, nuts, etc., have been omitted. The exhaust manifold before being bolted in place should be cleaned thoroughly with kerosene. Also it might be well to put new copper-bound asbestos gaskets around the exhaust openings in manifold. Along with the manifold the exhaust pipe and muffler should be cleaned. Run a rag soaked in kerosene through the pipe, hooking it on the end of a length of soft wire. The muffler must be taken apart and the inner chambers cleaned of all soot, etc. After this the parts can be put together again on the chassis. Before bolting the exhaust pipe flanges together, or the manifold on engine, place a little graphite on the threads of the bolts. It will make future removal easier. Put lock washers under the nuts that hold the muffler on the frame; in fact, put lock washers under all the nuts, no matter where the bolts are.

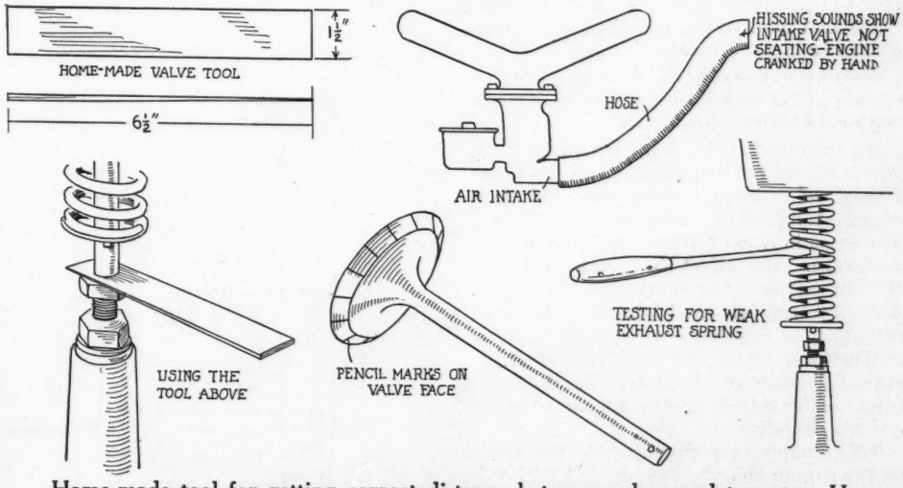
Gasoline System

The chief thing to do with the gasoline system is to give it a good cleaning. Take out the line going from tank to carbureter or tank to vacuum tank and run a soft wire through it. Remove the sediment bulb in the bottom of the main tank and clean out the screen. If the vacuum tank has been in use for a long period, take out the screws holding the top and lift out the inner tank. Be careful of the cork gasket under the head. Clean out all foreign matter from the inside of both tanks and remove the strainer located in the top, as shown in the illustration. Do not touch the float-operating mechanism; there is little chance of anything going wrong with it. Occasionally the float becomes punctured, but a little solder fixes this.

It would be well to take off the carbureter float chamber and clean it out. If the float is cork, put it in a warm oven to dry it out and apply a coat of shellac to it. Should the float valve not seat properly, indicated by continual dripping, grind it in with powdered glass. Clean the exterior of the carbureter and you can put back the whole fuel system. In doing so, wrap string around the pipe lines where the joints are made, so the lock nut will draw it up tight against the fitting. The string acts as a packing.

Lubrication System

If the lubricating system has been functioning properly, leave it alone. The only thing you can do is make sure the pump is pumping oil to the engine, if the latter is so equipped. If the oil leads are accessible, they might be taken off and washed out with kerosene. Many of the pumps are contained on the interior of the crankcase and so built that nothing is likely to get



Home-made tool for getting correct distance between valves and tappets. How hose can be connected to air intake for testing

out of order. Where there is a gage to indicate the level, this should be taken off and cleaned on the inside. There is an oil strainer in the base of some engines and once a season this should be taken out and cleaned. Wherever felt or cork washers are removed see that they are fit to use again. It is better to fit new ones when overhauling any engine.

Cooling System

Whether the car has been used all winter, with an anti-freeze solution in the radiator, or stored, it collects a certain amount of rust. To put the radiator in shape fill it with a solution of hot washing soda. Keep this in for several hours and then empty it, washing the inside out with clear water. This can be done by inverting the radiator and placing a hose nozzle in the water outlet. The reason for this is that most of the dirt and sediment collects in the top tank and in forcing it out this way it does not have to pass through the whole core. Put the radiator back on the frame and if it swings on trunnions, put oil in them, cleaning them out first.

If new hose connections are to be fitted, make them water tight by winding string around the pipes to a thickness of about ¼ in. Then apply white lead to the string and when the hose is slipped over and clamped it makes a very tight joint.

Before mounting the radiator slip on a new fan belt, if this is necessary. New gaskets may be necessary under the flanges of the water pipes where they bolt on the cylinder block. If there is a pump system of cooling, the stuffing boxes, or glands, of the pump may need repacking. Should there be any bad leaks in the radiator, solder them while the radiator is off.

Ignition System

Start on the ignition system by cleaning the interrupter housing of the magneto or battery distributor, if car is so equipped. This is done by squirting a little gasoline into it with an oil can. See that the points are in good shape and if they need dressing, use a very fine file. Most makers furnish a gage to be used when adjusting the points. On cars using systems like the Delco, remove the rotor and with a clean cloth and gasoline clean the rotor race. Then with the finger smear a little vaseline over the surface.

See that all wires are in good shape and if any appear oil-soaked, replace them. Solder terminals on all of the wires replaced. They look better and make a much more satisfactory connection.

An important point with magnetos is to check up on the coupling. Some of these consist of a leather disk, which if it is soggy is liable to throw out the timing. The same is true of other couplings if they are worn. The effect is constantly to retard or advance the spark and the engine does not run at its best. The Rayfield coupling for magnetos is designed with an automatic take-up for wear and once installed requires no attention. There is also a means for adjusting the magneto timing on this coupling.

This completes practically all the work on the engine and you can proceed with the rest of the car.

(*Concluded next week*)

To Ship Planes in Parts

1200 to 1500 a Month for Allies by September—For U. S. Sector Before

Non-Flying Aviation Branch Full for Present

WASHINGTON, March 16—From 1200 to 1500 finished airplanes will be delivered every month to the allies commencing Sept. 1, 1918, according to announcement made here yesterday. The planes will be shipped in parts and assembled in France or England where many mechanics have already been sent in special units for this very purpose. Recruiting for the non-flying branch of the aviation service has been suspended temporarily, as more men have volunteered than are needed at present. The progress made in aviation in this country is, according to army officials, greatly in excess of their hopes. A thousand men have been arriving daily at Kelly Field, Tex., for the last month, and additional barracks had to be constructed for them.

American-built battleplanes, it is said, will be in France by July in sufficient quantities to insure adequate air protection of the sectors then held by American troops. Figures on the aviation situation were placed before the full membership of the House Military Committee yesterday by Acting Secretary of War Crowell. It was disclosed that the aviation program is somewhat behind schedule with production about 60 days behind. Statements were made to the effect that there has been too much optimism and too many over-optimistic predictions and if it were not for these the work of the Aircraft Production Board would have been recognized as an extraordinary achievement.

The foreign contracts which were to have provided the initial fighting equipment for General Pershing's air forces were said to be still further behind the program.

Estimates of the time required to get a completed battleplane from the factory in in the United States to the front in France have been placed at ninety days. The War Department is now endeavoring to cut that period in half, and this will be one of the main duties of the new committee headed by Snowden Marshall.

Coincident with the announcement of the committee, Walter S. Gifford, director of the Council of National Defense, has been appointed acting director of the Aircraft Production Board and will have charge of executive details in the absence of Mr. Coffin who will go with the committee of investigation to see for himself just what conditions are. Mr. Gifford will retain his directorship of the Council of National Defense but spend his time at the aircraft board for the present. Howard E. Coffin states that despite all rumors good production is now had on the eight-cylinder Liberty airplane and several fighting planes of the twelve-cylinder type have been completed and are flying. He says that production of the fighting planes will be in the thousands within the next few months.

Congress originally voted an appropriation for 22,000 airplanes of which 7000 are to be the light training planes equipped with engines other than the Liberty and the other 15,000 are to be divided in quantities using the eight-cylinder and twelve-cylinder Liberty engine types.

The Senate Military Affairs Committee's investigation of the airplane program and other outside pressure is said to have had some influence in bringing the Presidential announcement of the new committee.

The Senate Military Committee unanimously has disapproved repeal of the laws paying extra allowances to aviators which reduction was recommended by General Pershing and Secretary Baker. It was shown that reliable army hazards statistics were not available and British and French aviators told the committee of the conditions and hazards of their experiences. Secretary Daniels has announced that in the future Navy aviators will be required to make a certain number of actual flights before being entitled to the usual 50 per cent bonus.

Congress yesterday appropriated $188,000,000 for the flying service of the United States Navy. This amount is three times the total appropriations for this service already made, making a total of $248,-

Spring Overhauling on Way

—Chicago Daily News.

000,000 which is now devoted to Naval flying operations.

The Navy has tried out and accepted the first fighting seaplanes equipped with Liberty engines and several are being delivered to the Naval air service. A large fleet of them will be obtained to be added to the forces engaged in hunting submarines in the war zone. The seaplanes are somewhat similar to the British flying boats and are equipped with two Liberty engines, providing 700 hp. which is considerably in excess of the power used in a similar British craft. Their performance is expected to be proportionately better.

The Aircraft Production Board has announced that its engineers now have overcome the last minor defect of the Liberty engines, which has to do with the lubrication system.

TO CALL THEM EAGLES

Washington, March 15—The submarine chasers being built by Henry Ford will be known as Eagles and will constitute the Eagle class of boats in the Navy. The decision has just been announced by the Navy Department.

TO HOLD EXAMINATION

Washington, March 16—The United States Civil Service Commission announces open competitive examinations applications for which will be received soon for an automotive engineer, automotive body designer and an automotive draftsman in the Quartermaster Corps. Full information and application blank may be obtained by addressing the United States Civil Commission.

19,000 STEEL WHEELS ORDERED

Detroit, March 16—The Detroit Pressed Steel Co., has received an order from the Government for 19,000 steel wheels for the Signal Corps. Production on this order started thirty days ago and the first delivery will be made this month. It is expected the order will be complete by the end of May. The company is not sidetracking its product for passenger cars.

EIGHTY SPACES FOR CHICAGO

Chicago, March 18—More than twice as many spaces have been sold for Chicago's Second Annual Exchanged Automobile Show which will be held in the Coliseum March 30-April 7. Only forty spaces were sold last year. More than eighty have been taken to date, and last year's sales of $181,345 are expected to be doubled. All the main building and the annex will be used this year, as compared with about 75 per cent of the Coliseum floor last year. Car exhibits will occupy the center spaces, accessories will be located in the balcony, and trucks and truck-forming attachments will hold forth in the annex.

Every car exhibited at the show will undergo inspection and appraisal at the hands of a committee before going on display. The committee started work March 15 inspecting, testing, etc. the cars to be offered for sale. As cars are sold they will be moved off the floor and others put in their places.

Three Air Investigations

Coffin, Marshall and Borglum to Trace Cause of Alleged Delay in Schedule

Liberty Engine Undergoes Tests at Washington

WASHINGTON, March 18—Special telegram—Three investigations are under way to discover why the aircraft program is ninety days behind in schedule, which is claimed by the Senate Military Affairs Committee. One is being conducted by Howard E. Coffin, chairman of the Aircraft Production Board, who is determined to run down the various reports and rumors; another by H. Snowden Marshall, chairman of the committee appointed by President Wilson and working with the Super-War Council, and a third by Gutzon Borglum, New York sculptor, who occupies a most mysterious niche in the situation.

It is reported that President Wilson already has received a secret report from Mr. Borglum regarding the delayed program, and the report adds that Mr. Borglum carried a letter from the President to the airplane industry and, in fact, to all concerned to aid him to get complete data. Mr. Marshall's duties will include the whole matter of delayed production. Mr. Coffin is working more specifically to run down the reports and rumors of troubles in the making of the Liberty engines, which are believed in the main to be unfounded. Mr. Coffin left Washington last Friday to make a complete tour of all the plants, and his report later will be checked up with the other and by officers of the Signal Corps whose duties include supervision of any mechanical or production irregularities that might develop.

There have been some suggestions of a profiteering ring which had enmeshed the aircraft program, but these suggestions are said to be without justification. The Signal Corps and the Aircraft Production Board are both emphatic in requests that if there is any suggestion of profiteering it should be disclosed.

Employment of woman machinists in the factories producing Liberty airplane engines is proving very satisfactory, according to the Aircraft Production Board. At the present time several hundred women are working lathes, drill presses and other machines for converting rough castings into finished parts.

The Liberty airplane engine which was shipped to Washington arrived yesterday and was tried out in a Curtiss plane under direction of Major A. J. Smith. It is expected that many flights and tests will be made during the next week. Apparently there is going to be some competitive testing. Col. Charles F. Lee, using an Avon machine, is here also, and Lieut. George Flaschaire of France is enroute to Washington with a high-powered French machine. Sites for the mail routes between this city and New York will be selected this week. The Polo grounds have been selected in Washington as the Terminal. The Postoffice Department announces that the air service will begin May 1.

The War Department has made a new ruling that civilian instructors will no longer be used in aviation schools and only commanding officers will do the instructing.

The start of the airplane mail service between Washington, Philadelphia and New York was delayed because landing fields have not yet been found at Philadelphia and New York. The service originally was planned to begin April 15 with Army aviators as pilots and a trip between the cities each way every day. It is stated that the League Island field at Philadelphia was not found available, and a committee of Army fliers and postal officials will begin investigation of other Philadelphia sites. It then will go to New York to inspect sites there. At present the airplanes require starting and landing fields 2000 ft. sq. The Postoffice Department is experimenting with devices which will allow starting and landing of airplanes on smaller fields and possibly from the rooms of large buildings.

N. A. C. C. TAKING CENSUS

Washington, March 15—The National Automobile Chamber of Commerce is sending to each manufacturer of motor cars a blank statement to be filled in and returned to it showing the number of cars produced since the beginning of the fiscal year, materials on hand, commitments and what production would be without curtailment and what it will be with the 30 per cent curtailment arranged between the fuel committee of the industry and the Fuel Administration. The chamber will file these reports with the War Industries Board, which, while the reports are not sworn to, will retain the right to order special investigations of any company or companies in the industry.

DETROIT-PONTIAC TRUCKING ON

Detroit, March 15—Pontiac is connected with this city by a motor truck line operated and owned by the General Storage & Cartage Co., Inc., Detroit. The present service is intended for bulk tonnage, but package service will be installed soon. Five motor trucks of from 5 to 10-ton capacity have been assigned to the service. The trip between the cities can be made in 2 hr. The charge for the service is as follows, the classification being the standard railroad system.

In cents per hundred pounds: First class, 18.8; second class, 16.7; third class, 12.5; fourth class, 10.4; fifth class, 9.

YORK DEMANDS CAR LICENSES

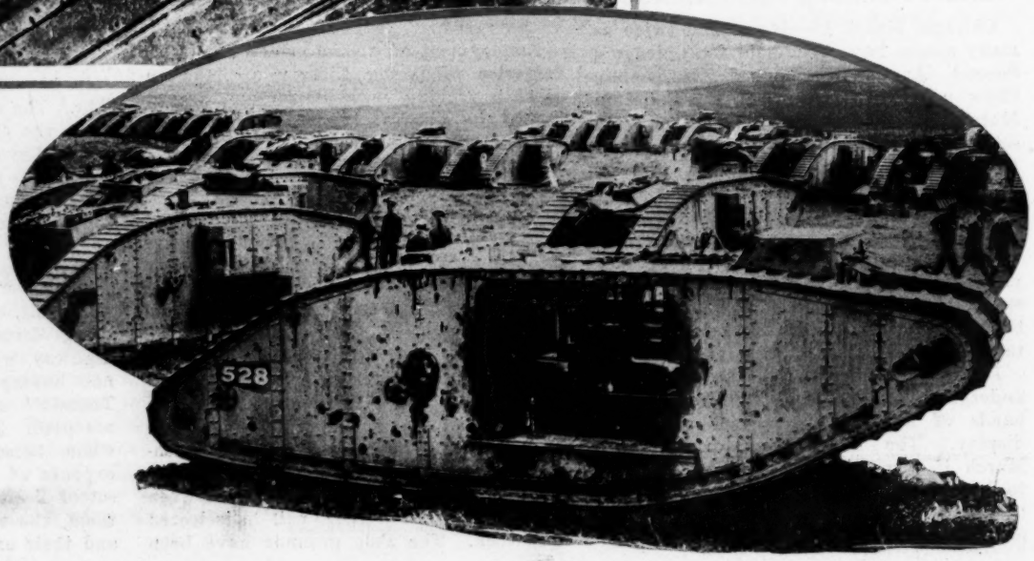
Detroit, March 16—Sixty Oldsmobiles being driven overland via the Lincoln highway were held up at York, Pa., for not having license tags. The "Car in Transit" signs the cars bore were not accepted. The New York distributor to whom these cars were consigned met an expense of $720 in securing the complete set of license plates, the fines charged for them, the salaries of the men while idle and their expenses.

Seen Through the War Camera's Eye

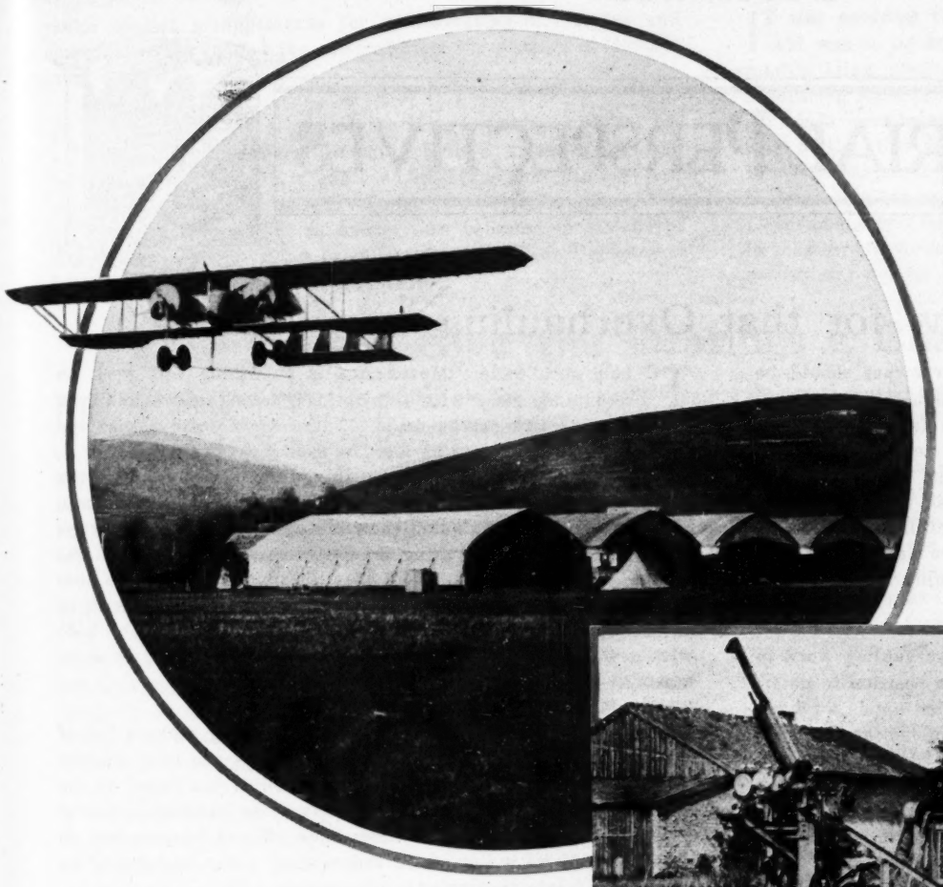
Five tanks were making an attack as a French air scout took this picture from his plane. They are in No Man's Land, that desolate and deadly area between the trenches of the Germans and French trenches

Germans occupy the trenches seen at the top. They are sharp, clean cut, made with mathematical precision, of reinforced concrete. In front of the trenches are three separate systems of barbed wire entanglements, which have been penetrated by the first of the tanks. The French shells blotted out the wire entanglements at the right, and the artillery has smashed and almost obliterated the concrete trench

The tanks are completing the work of the guns. Along the lower part of the picture is the ragged line of French trenches. These are temporary trenches, dug part way across No Man's Land for shelter until the tanks could clear the way. One tank seems disabled at lower left

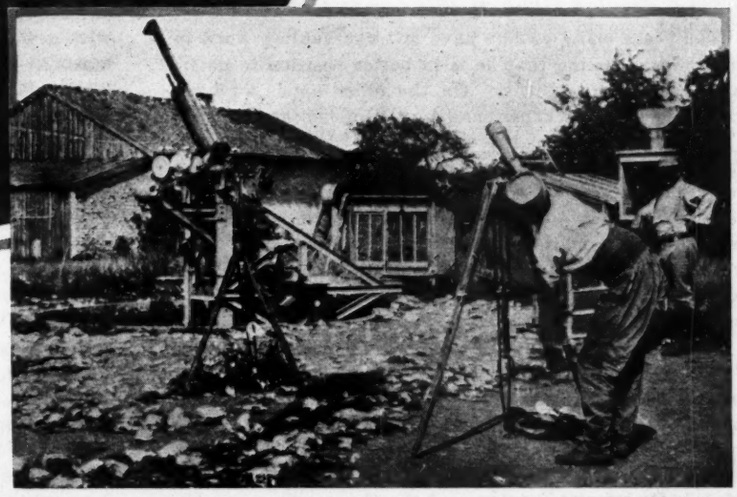


A company of tanks, a tankdrome. More than twenty British tanks are collected here. The removal of the side armor from the one in the foreground gives an idea of the mechanism that operates these monsters

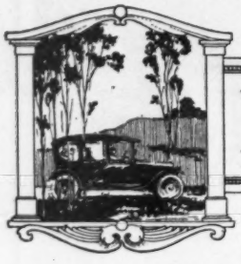


French observation and bombing avion. On the right of the machine sits an observer and a gun pointer. On the left sits the pilot. All in wait for Boche aerial game

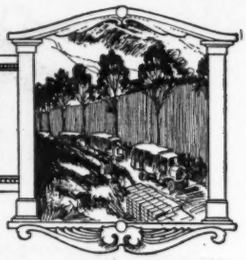
Looking for enemy aircraft. French anti-aircraft guns in what seems to be a former garden patch. German air raiders fly so close they can be recognized sometimes



An overland army schooner in Saloniki. This is a Packard truck that is in use just now for conveying soldiers in the Greek city



EDITORIAL PERSPECTIVES



Now for that Overhauling

OVERHAULING time is here. Every car owner should be thinking seriously of that annual occasion when bearings must be taken up, brake bands relined and, in fact, the car gone over from radiator to tail light so the whole mechanism may be tuned to concert pitch, ready once more for the rigors of a hard season. Cars that have been in commission all winter as a rule will require more overhauling than those carefully tucked away during the cold weather. Some owners have done their overhauling since the car was stored last fall, gaining the advantage of getting their cars on the road sooner.

IN previous years many owners have left overhauling work to the repair man, feeling that he is in better position to determine as to the car's condition. On the other hand, we have those who from previous experience or natural mechanical tendencies make their own repairs. Still others are compelled by circumstances to do their own overhauling. In any case, the man who goes after his own car and makes the necessary adjustments demanded by any piece of machinery is fortifying himself with a wealth of information. Should such an owner be caught on the road with a breakdown or mishap, the chances are he is in far better position to get home by the fruits of his own efforts than the man who has never delved into the inwards of his car.

THIS spring more than ever before, owners will be called upon to do their own overhauling. Many garages, especially those in the outlying districts of the larger cities, are working short-handed, principally on account of the draft, etc. The war has placed many a car owner in a new position. Perhaps you are one of them. Perhaps you are one of the thousands of owners contemplating your own overhauling so the nation's repairmen may concentrate on trucks and tractors, which they will be called upon to do to keep transportation at its best.

TO help such owners MOTOR AGE is publishing this week an overhauling story with illustrations, telling where and how the adjustments must be made. There are certain things the owner cannot do, unless he has the machinery and tools for it. But there are a hundred and one things he can do to bring the cars into perfect condition again. Incidentally he becomes familiar with the car's vitals and the more he knows about the whys and wherefores of everything the better care he will take in the future. When, for instance, he finds the inner layers of the hose connections have separated and caused the water passages to be restricted, he will realize the importance of replacing the hose with new ones when the engine shows signs of mysteriously overheating. The same is true of many other parts.

BEFORE you get ready to do your overhauling, make a list of the parts you are going to need. Perhaps you have wanted to put a new connector on the tail light, which you taped on the last time it jarred loose. A grease cup may be missing on one of the spring links. They sometimes back off and become lost on the road. Make a list of all the missing parts and get them before you begin to dissemble the various units.

WHATEVER you do, work logically. Do not jump from the brakes to the radiator. Do all the work on the engine first; there is a lot of dirty work to be done and it is best to get it out of the way first, finishing with such parts as the upholstery and touching up here and there with paint or varnish. Go out into the garage a few days before you are going to tackle the car and put a little kerosene or oil on nuts and bolts that look rusted. Some of these, especially those on the exhaust pipe flanges, etc., get stuck very tight and it is better to help matters by allowing them to open up by this method. Then when you wish to take them out, they will respond to ordinary treatment.

A Maryland Monstrosity

MARYLAND'S proposed attempt to increase her motor vehicle fee for trucks to a point such that the income will rebuild her roads and keep them in repair has made it necessary to tax one trucking concern in particular which is operating between Philadelphia and Baltimore, $340 per year for each truck. It does not appear probable that no matter how soft the road and how poor its original construction that one truck could do $340 worth of damage in twelve months' time. This particular absurdity is not the serious part of the measure. The really important feature is that the attitude of the state legislature is that freight-transporting vehicles should be made to pay.

THOSE who are responsible for the measure have not considered the fact that the property of the tax payers within the state is increased in value by the road improvement; that to replace the worn-out macadam roads with permanent roads of brick or concrete would add greatly to the value of the land. These same Maryland farmers, who are looking to the motor trucks to pay for the rebuilding of their macadam roads, the ones who before any road improvement was made bought their land at $25 an acre and are selling it now at $250 per acre. With further road improvement the value would be still further enhanced.

War's Wear on Roads

NOW that the Government is using our highways to such a great extent for the transportation of war trucks and war materials and undeniably is wearing out the highways in many states much more rapidly than they have been worn in other years, the question asked by the state highway authorities is a most pertinent one. The road men in every state and county on the Government military routes are asking what the Government is going to do toward repairing the roads the trucks destroy.

TRUE, the Government has provided through its Federal Aid Law for assistance on certain roads where state and county appropriations equal in amount are made, but in many instances the Government is using roads which so far have not come under the Federal Aid appropriation and it is only through local and state funds that they have been put into shape and are being maintained. It is not improbable that the War Department or some other branch of the Government will

make special arrangements for remunerating the states and counties, whose roads have suffered from the passage of Government trucks.

SUCH action on the part of the War Department is not unprecedented. General Pershing built a concrete highway in New Mexico. There is one road in Texas that the Mexican expedition destroyed and for which the War Department is making payment. There is a case now in court in which the state of Arizona is trying to collect from the War Department for roads destroyed by military trucks.

IT was assumed that the arrangement under which Federal Aid was to be extended to the states and counties for their road-building program would be on such route as would be connecting lines for military use should emergency arrive. But our roads were in as bad a state of unpreparedness as were the most of the other features of the nation when war was declared. It became necessary to utilize roads which were not constructed to bear the heavy traffic that the war made necessary. The Government will have to enlarge its Federal Aid arrangement to take care of those specific roads. War's wear on roads must be met by war aid for roads.

Give the Bearings a Chance

DRIVEAWAYS do more than merely get the car to its future owner. They prepare it for him. Such a car when delivered to the average car buyer is in better shape to stand abuse than the one delivered in crated style. By abuse we mean the lust for seeing what it can do on the road, which seems to have been instilled in green drivers, likened to the small boy with a new toy.

MEN who drive the cars from the factory know how important it is to give the bearings a chance to get worn in. They know the car must not be driven over 15 m. p. h. for several hundred miles so the oil can get into the bearings and cylinders properly to give the surfaces a chance to smooth out. These driveaway men humor the car. Their experience has taught them it is necessary.

CONVERSELY the average buyer, especially if he has never owned a car before, in his enthusiasm to see the needle of the speedometer climb shows no mercy for bearings and rough surfaces. He steps on the accelerater for 20, 30 or even 40 m. p. h., before the car has gone a few dozen miles. Such an owner wonders why his car depreciates so much more quickly than a car of similar make in the hands of his neighbor.

THE reason is not far to seek. The neighbor understands how vitally necessary it is to drive the car judiciously the first several hundred miles. True, most cars, especially the engines, are given some sort of a running in at the factories, but when you get all the units assembled in a frame, mount it on springs and finally on wheels, then subject the whole mechanism to jars and jolts over give-and-take roads, needless to say, time must be given the parts to become acquainted with each other, so they will work in complete harmony.

A CAR either is made or unmade in the first 500 miles. Let any car fitted with a stiff new engine be run at comparatively high speeds, and the cylinders become dry. They will be scored so the car never will perform like the designers intended it should. The space between the bearing surfaces of a new car is very small and therefore the oil cannot get between it as readily as when this space has been increased slightly by careful handling with plenty of clean oil.

M. & A. M. to Carry On

Will Continue Active Work to Assist U. S. Government in Its War Work

NEW YORK, March 15—The Motor & Accessory Manufacturers' Association is going to continue active work in Washington by way of assisting the Government in war work and also assisting its members in connection with this work, and for these activities A. W. Copland, who was chairman of the Automobile Industries Committee until it was dissolved and who represented the accessory association as chairman of this committee, will continue to represent the 308 members of the association. Mr. Copland will have headquarters in the Ouray building, Washington, D. C., and will be the point of contact between the various Government departments and all the members of the association. He will continue to carry on the work that he was carrying on for these manufacturers during the life of the Automobile Industries Committee.

The Motor & Accessory Manufacturers' Association at its regular monthly meeting held to-day, did about the only thing that was left for it to do after the National Automobile Chamber of Commerce had withdrawn its representative, Hugh Chalmers, and after the Ford company had withdrawn John R. Lee, its representative, from the Automobile Industries Committee, namely, to continue its Washington representation alone and leave Mr. Copland, who has proved himself an able point of contact between the industries and the Government since the appointment of the committee last November, in charge.

In taking this action the Motor & Accessory Manufacturers' Association in a letter to its membership states that it considers that the work done by the Automobile Industries Committee has been very satisfactory and that the spirit of co-operation last November as embodied in the committee was a wise move. The following closing paragraph from this letter to its membership expresses the appreciation of the association:

"Your directors cannot refrain from commending the work of the Automobile Industries Committee and the loyal unselfishness, patriotic and sacrificing services of the members of that committee, Messrs. Copland, Chalmers and Lee."

The Motor & Accessory Manufacturers' Association also has addressed a letter to the National Automobile Chamber of Commerce asking that body to co-operate in a letter of appreciation to the Automobile Industries Committee for what it has done, as follows:

"We believe that the unselfish and loyal work of Messrs. Chalmers, Lee and Copland should at least be rewarded with a vote of thanks and the directors of the Motor & Accessory Manufacturers' Association desire to express to the directors of the Na-

(*Concluded on page* 21)

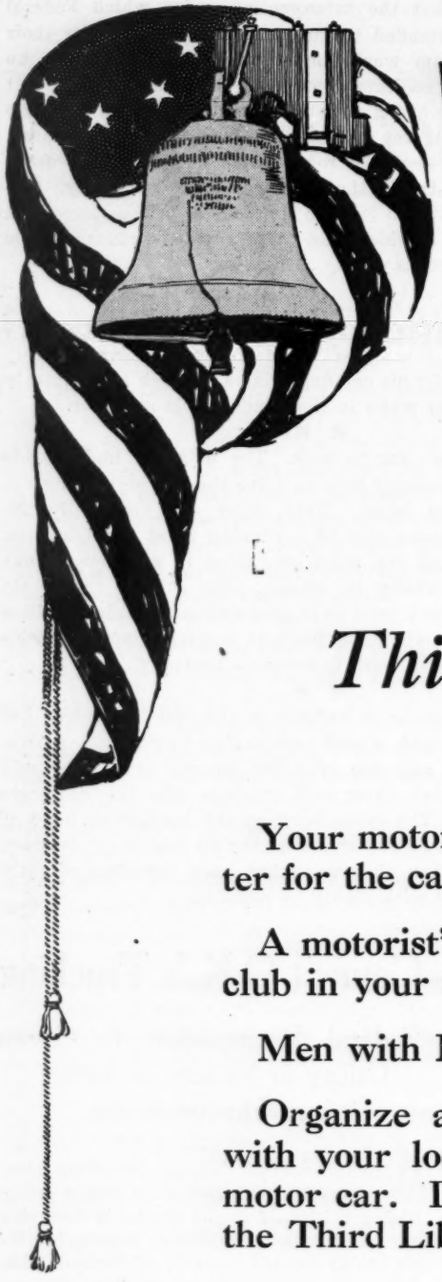
Council O.K.'s Trucking

Federal Recognition Is Given Utility of Motors in Relieving Transportation

WASHINGTON, March 18—First Governmental expression of policy recognizing utility of motor trucks in relieving our transportation situation was made public to-day by the Council of National Defense at the instance of Roy Chapin, chairman Highways Transport Committee. In its statement of policy the council says:

"The Council of National Defense approves the widest possible use of the motor truck as a transportation agency and requests the state councils of defense and other state authorities to take all necessary steps to facilitate such means of transportation, removing any regulations that tend to restrict and discourage such use."

Such announcement of policy, bearing as it does the stamp of Federal authority, will have most important effect on widening the use of the motor truck and highways for transportation of freight, as it will tend to restrict ill-advised measures of state or local authorities, such as unwise taxation and load regulations. It is probable that this statement came forth at this time to influence the Maryland tax measure now before the legislature of that state, which is considered elsewhere in this issue.



Motorists

Get Busy

on the

Third Liberty Loan

Your motor club--if you have one—is a logical center for the campaign.

A motorist's Liberty Loan committee—if there is no club in your town—can put it over.

Men with Motor Cars can cover the country.

Organize a Liberty Loan committee. Co-operate with your local chairman. Do it NOW. Use your motor car. It's a Great Little Time Saver. Let's put the Third Liberty Loan OVER THE TOP.

BUY A BOND

Will Maryland Throttle Her Highways?

Proposed Truck Fees Will Increase Freight Congestion—Object to Repair Roads

WASHINGTON, March 16—The state of Maryland has the idea that the users of the highway should pay all costs of the highways, particularly if the users are motor trucks. The 5-ton trucks which are carrying Government supplies from Philadelphia to Baltimore are taxed $342 a year license. This does not seem to be enough for patriotic Maryland as there is a bill before the state government in which they are going to double this registration fee, or make the registration for such a truck $682. Some of the patriotic citizens of the Commonwealth declare that two years hence at the next meeting of the legislature this rate will be doubled, and $1,364 per year charged by way of tax on a 5-ton truck.

Maryland claims that the trucks are wearing out its roads to such extent that this amount will be needed from the trucks in operation to get them back into shape again. In other words the people of the state anticipate rebuilding and maintaining their roads almost wholely from increased taxation of freight transportation over their highways. They expect to make the freight transported by motor truck pay for the repair of roads, which, had they been really permanent roads in the first place, would not have needed repair.

It seems that the state is determined to have money and as an excuse for doubling truck registration declares that motor trucks are working a damage of $300 per truck per mile on the roads. The road authorities declare they cannot keep the roads in condition without these funds. These road authorities and the Government authorities as well do not mention that the highways system of Maryland is not suited for motor truck traffic, although motor trucks are essentials in this war. Maryland secures $500,000 per year from motor vehicle registrations for maintenance of its roads and in addition gets $100,000 from the general state funds for this work.

This Maryland situation shows what dangers the nation faces and the motor vehicle as well in the pernicious practice that has been in existence for several years, namely, not building roads that are suited for traffic. Maryland has boasted of what she was pleased to declare as an ideal, modern road system, but now after a few months of National traffic, which roads are expected to stand and which roads must stand in emergencies, such as war, the fallacy of the Maryland road-building program becomes very apparent. It would seem that Maryland hopes to make it possible to re-build her present highway system out of registration fees from motor trucks and motor vehicles and that in this re-building process she will finally build highways that will stand such traffic as is at present being placed on many of our highways because of war conditions.

The proposed action by Maryland is not a thing of local interest only. It is of national importance, because legislatures in other states are quite likely to try the same method of increasing state funds, if they find that Maryland can "get away with it."

The highways in the state, which have been worn badly, are the macadam surface roads; those having brick or concrete surface have not shown wear.

English Gasoline Limits

Not More Than 10 gal. a Month Allowed Car for Business Purposes Only

LONDON, Eng., Feb. 16—The latest regulations with regard to the use of gasoline in connection with gasoline licenses limits the amount of fuel as follows:

Passenger Cars—No fuel for ordinary purposes designated as pleasure purposes. For business purposes not exceeding 10 gal. per month.

Motorcycles—Not exceeding 2 gal. per month.

Physicians' Cars—Not exceeding 50 gal. per month.

Taxicabs—40 to 60 gal. per month according to the size of the city or town.

Passenger Buses—Approximately 45 per cent of the estimated requirements in June, 1916.

Renting Motor Cars—Approximately 20 to 30 gal. per car per month, the amount depending upon the number of cars owned by the applicant for the license.

Delivery Wagons—For light-capacity delivery wagons 24 to 30 gal. per month.

Commercial Vehicles—The amount depends upon the load-carrying capacity and the monthly mileage. The scale which is a general guide for allowances is as follows:

Useful Load, Tons	Miles Per Gallon	Miles Per Month	Gallons Per Month
1	13	1200	85
1½	11	1100	95
2	9½	1000	105
2½	8	950	120
3	6	900	150
4	5¾	900	155
5	5¾	850	165
6	4¾	800	176

In connection with the sale of gasoline, the board of trade, under the Defense of the Realms regulations limiting the retail prices of all motor fuels, has placed a profit on gasoline sold by retailers to 10 cents per gallon above the cost of it to the retailer. This order also limits the price of kerosene to 8 cents per gallon above its cost to the retailer.

For some time the price of gasoline has been limited to 15 per cent by agreement between the importers and the Motor Trade Association, which is an organization of motor interests. The new order gives legal sanction to the price and also places the maximum profit at 10 cents per gallon.

English Tractor Trials

Schedule Outlines Competitive Events for Sectional and National Marks

LONDON, Eng., Feb. 15—A comprehensive schedule of tractor-plowing competitions which are largely sporting competitive affairs has been started in England. It is the result of an experiment tried in several districts by the food production department, which tried the experiment to increase the acreage plowed by tractors to the maximum.

The scheme as now outlined for the entire country consists of a series of sectional and national competitions as follows.

First for units.
Second for counties.
Third for the whole of England and Wales.

Each competition will continue for one month and the dates are as follows:

First competition begins Feb. 9.
Second competition begins March 9.
Third competition begins April 6.

This schedule means there will be three monthly competitions for each unit. There will be three for each county and three national ones. This arrangement provides for admission to the competition of additional men and machines that may be added to the Nation's agricultural tractor power during the spring plowing season. The details of this three-fold competition are:

1—For each unit—A distinctive flag to be carried on the tractor will be awarded to the tractor team in each unit which plows the greatest number of acres during each period of four weeks. This flag will be presented each month by the tractor representative of the county.

2—For each county—A championship flag will be awarded to the tractor team in each county which plows the greatest number of acres during each period of four weeks. A distinctive badge also will be worn by each member of the winning team. The flag and badges will be presented each month by the chairman of the county executive committee.

3—For England and Wales—A championship shield to be carried on the tractor will be awarded to the tractor team which plows the greatest number of acres in England and Wales during each period of four weeks. A small silver replica of this shield also will be given to each member of the winning team. The shield and replicas will be presented personally by the director-general to the winning team, which will be invited to London for the purposes of the presentation.

Each trophy will be held for four weeks only, unless again won by the same team.

The complete scheme of competition not only makes awards to those doing the most plowing but gives a national significance to the movement, which results in increased plowing at a time when a national stimulant is imperative.

LOZIER MAKES FIVE DAILY

Detroit, March 13—The Lozier Motor Co. still is making cars on order. The production is five cars daily, and it is steadily increasing. The company has orders for six months. Theo. Freiberg is president and treasurer. Henry Butzel is vice-president and secretary.

$263,096,610 for Roads

War Conditions Bring About Large Part of Increase from $118,797,750 in 1917

South and Middle West Appropriate Most for Work

CHICAGO, March 18—That highway improvement is to continue in 1918 with a vim is emphasized by figures compiled by the touring bureau of the B. F. Goodrich Rubber Co. The Government, states and counties will spend a total of $263,096,610 for highway improvement in 1918, as compared to $118,797,750 in 1917. Calculations by Government officials are that with good highways, motor trucks and motor vehicles are capable of carrying approximately 200 per cent more freight than the railroads. In these same calculations they estimate the value of our highways at $6,240,000,000.

Appropriations in the South and Mid West exceed those of the rest of the country by many millions. Texas leads all others with contemplated highway development. It spent $5,000,000 on roads last year; this year it will spend $25,000,000.

War conditions have brought on most of this increase. All parts of the country are making use of motor trucks for haulage to an ever-increasing extent. Oregon, for an instance, is spending five times what it did last year to build trunk roads into the timber tracts, from which wood for U. S. ships is coming.

Illinois and Indiana rank next to Texas in expenditures for road-building. Indiana has 175 miles of the new market highway to take care of.

ST. LOUIS SHOWS AND SELLS

St. Louis, Mo., March 18—The attendance at the used car show last week was a disappointment but the sales were above expectations. Manager R. E. Lee estimates the attendance at 1000 daily and the number of cars sold at slightly more than 100, about 75 per cent of the cars shown at one time. These sales were those made in the show rooms. More than a dozen sales on the row have been reported and it is believed that these are only a part.

The attendance the first night was the best of the week, but the exhibitors now believe that to have made the show an attraction, they should have exhibited older cars than they did. Many 1917 cars were displayed and more 1916 than any other year, a few from 1914 and only two or three as old as 1913. The best attractions were de luxe cars that had been owned by rich young men, but these did not survive the second day. The average price of the cars exhibited was more than $700. The buyers and spectators alike were disappointed at the lack of light cars. A Buick roadster, light, model of 1913, was $275, the cheapest car shown, except a Ford sold the first day for $250. The bulk of the exhibits appeared to be Packard, Cadillac and Hudson types. A Cadillac was sold for $2,250.

FORDSON TO EMPLOY 100,000

Detroit, March 16—Eventually 100,000 men will be employed by Henry Ford & Son in the manufacture, assembling, service and distribution of Fordson tractors. The temporary plant at Dearborn now is employing 2000 men. The permanent plant will be located directly across from the blast furnaces. This plant will employ approximately 25,000 men. The Dearborn plant was used as an experiment station and fifty different models were built before the present perfected tractor was decided upon. The following year construction work on the temporary plant was started.

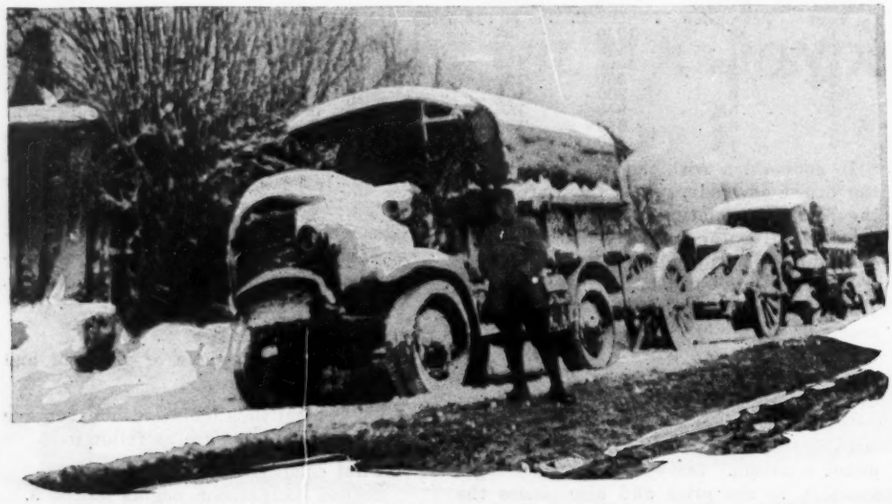
Today the $3,500,000 plant is nearing completion with the erection of an office building 192½ by 70 by 40. It includes a foundry, 120 by 225; stockroom, 30 by 100; heat-treating room, 40 by 145; assembly shop, 44 by 165; assembly shop, 44 by 105; pattern shop, 50 by 105; gas-producer, 70 by 45; machine shop, 285 by 75; machine shop, 225 by 90.

After the permanent building is erected the Dearborn plant will be used as one of the numerous assembling plants which will be scattered all over the country.

4500 ENGLISH GAS TRUCKS

London, Eng., Feb. 14—At present 4500 motor trucks are running on gas carried in the large rubber gas bags instead of using gasoline, and to-day orders are in hand for gas containers for 2500 motor trucks which have not been able to secure them up to this time. These figures indicate that gas is certain to be used to a very large extent not only because of its economy but because the production of excess quantities of gas is inevitable from the process for the production of benzol from soft coal, which benzol then will be used as well as gasoline. The production of gas is also certain because of coke manufacture, the coke being used in heavy commercial vehicles. This increased use of benzol and gas appeals to the motorist in that it makes them independent of imported fuels, which is a consideration in days when ocean tonnage is at such a premium.

There has been some misunderstanding of the use of gas in that too many have concluded that it is being used by passen-



Snow troubles have retarded trucking in Europe as here this winter

ger cars which have been denied the use of gasoline. The fact that only 4 per cent of the total deliveries of gas apparatus to date has been to owners of private cars indicates that the use of gas has been taken up by the business man for his motor trucks. Further orders of gas apparatus for passenger cars cannot be accepted, as the use of gas for cars is practically subject to the same restrictions as gasoline.

It is estimated that the saving of gasoline for motor trucks and other business vehicles alone amounts to 3,000,000 Imperial gal. a year due to the use of gas.

Recently a gas traction committee was formed by the Government to consider what further rules are necessary with regard to gas as a fuel. This committee will issue a report in a few weeks containing recommendations for the use of gas and flexible containers at atmospheric pressure and also will indicate the limits of approved use under limited pressure in semi-rigid containers.

BUDA LICENSES U. S. ONLY

Harvey, Ill., March 18—The arrangements made by the Buda Co. in regard to production of its HU 4¼ by 5½ engine, referred to in the issue of March 14, are for supplying the Government only. The company has licensed the United States government to produce this Buda model by outside makers, who are to make them for the exclusive use of the Government. The Buda Co. has furnished detailed prints, patterns, etc., to the other manufacturers to assist them in the rapid production of these engines.

AVERY HOLDS SERVICE SCHOOLS

Peoria, Ill., March 18—The Avery Co. is holding a series of thirteen service schools in distributors' territories. The sessions, which last all day, take up, in turn, the engine, ignition, tractor and motor cultivator, and under these divisions the dealers and farmers of the territory study service on the various parts. The schools are free and under the supervision of competent instructors furnished by Avery. In connection with them is run a 1000-ft. film of the Fremont, Neb., national plowing demonstration. The object of the schools is to get tractor owners and all others who may be interested together with competent instructors where they can exchange ideas, ask questions and get actual experience in the handling, taking care of and repairing of tractors.

SERVICE MANAGERS ORGANIZE

Detroit, March 19—Special telegram—Believing that by banding together they can render better service to customers and also benefit themselves, the service managers here met last night and formed what will be known as the Automotive Service Managers' Association. Besides electing officers they discussed the advisability of a uniform charge for service. The zone system is now under consideration. The matter of taking care of customers in the order they enter the service station also was discussed. The officers are: L. R. Alexander, president; H. Rose, vice-president; L. H. Grussey, secretary-treasurer. Meetings will be held bi-weekly.

Tractor Type Discussed

Credit for Origination of Track-Laying Kind Given to 1859 Inventor

Demand for 100,000 Next Year Is Foreseen

CLEVELAND, Ohio, March 16—The future of the tractor and its development to date, particularly in regard to the creeping type were considered by W. H. Tewksbury of the Cleveland Tractor Co. in a paper on "Industrial Track-Laying Tractors" at the meeting of the Cleveland section of the Society of Automotive Engineers here last night. Mr. Tewksbury stated that there is a demand for from 100,000 to 500,000 tractors during the next year in this country and that the maximum possible production would be 100,000. The Cleveland company, he stated, aims to reach a production of 50,000 per year.

Credit was given for the origination of the truck-laying type of tractor to an inventor by the name of Miller, who in 1859 brought out a rigid frame type of steam-driven device with flexible side members. Mr. Tewksbury said that the first man to use the pivoted side frames giving vertical and lateral movements both to the flexible members of the tractor was Hanscomb in 1883. He stated that this was the basis of the present type. Credit for being the direct father of the track-laying art in this country was given to Alvin Lombard, who in 1907 brought out a device which was driven by a steam engine, having a sled in front and the rear wheel with a drive which, Mr. Tewksbury stated, was similar to the present day crawler type having a sliding block in contact with the ground. After thus briefly sketching the past history of the crawler type of tractors Mr. Tewksbury showed a series of motion pictures and lantern slides illustrating the different uses of the Cleveland tractors and also showing some of the French tanks in action.

The discussion after the meeting was largely taken up with the farm uses of the tractor and Mr. Tewksbury pointed out that the two-plow machine had been found by the Cleveland company to be the most economical type. He also stated that the unit pressure on the Cleveland type was 5 lb. per square inch, which he stated was less than that given by the human foot. This makes the crawler type very adaptable for marshy types of ground, such as commonly are found in rice plantations, etc. The motion pictures showed the adaptability of the crawler type of tractor in extricating itself from difficult tractive conditions particularly as regards the crossing of ditches and marshy stretches of ground.

BAY STATE FIGHTS SURTAX

Boston, Mass., March 16—The motorists of Massachusetts are up in arms against a proposed measure to raise $1,500,000 by a surtax on car owners. The measure calls for additional fees of $5 from owners paying $15 now; $10 from those paying more; $2.50 for trucks a ton; $1 for motorcycles; $5 each for dealers' cars; $2 for operators and drivers. A subcommittee has been appointed to draft a bill.

SAXON LEASES BUILDING

Detroit, March 15—The Saxon again has leased the Cooperage building known as Plant 5 for a term of five years with an option of renewal if it should move into the new building now occupied by the Government. The company would occupy both plants. Should peace be declared, it is provided that the new building will be vacated by the Government, permitting Saxon to move in within sixty days. The average daily production of the company is 104 cars.

PEERLESS PROFITS $1,065,869

New York, March 15—Net sales of the Peerless Truck & Motor Corp. in 1917 amounted to $18,924,451, exclusive of munitions contracts, an increase of $5,399,428 over 1916. Profits are $1,065,869 after deduction of interest and reserve for depreciation, losses and taxes. This amounts to 10.6 per cent of the $10,000,000 outstanding common stock, as compared with 13 per cent, or $1,356,358, in 1916.

A snow-burdened motor truck in service "somewhere in France"

Who's Who in War Orders

Names of Companies Holding Contracts in Motor Section of Army Equipment

Name and Location	Quantity	Item
Garford Motor Truck Co., Lima, Ohio	900	Chassis
Locomobile Co. of America, Bridgeport	1,650	Chassis
Pierce-Arrow Motor Car Co., Buffalo	2,300	1½-ton trucks
	1,000	5-ton trucks
Packard Motor Car Co., Detroit	4,800	3-ton trucks
Harley-Davidson Motor Co., Milwaukee	8,125	Motorcycles
Hendee Mfg. Co., Springfield, Mass	5,500	Motorcycles
Mulholland Co., Dunkirk, N. Y.	500	Truck bodies, Type A,
Hercules Buggy Co., Evanston, Ind.	400	Truck bodies, Type A,
International Harvester Co., Chicago	1,000	Truck bodies, Type A,
Theodor Kundtz Co., Cleveland	550	Truck bodies, Type A,
Grand Rapids School Equipment Co., Grand Rapids	6,400	Truck bodies, Type B
Continental Car Co., Louisville, Ky.	2,000	Truck bodies, Type B
Eagle Iron Works, Auburn, N. Y.	1,200	Truck bodies, Type B
International Harvester Co., Chicago	9,000	Truck bodies, Type B
Edw. G. Budd Mfg. Co., Philadelphia	5,000	Truck bodies, Type B (steel)
J. G. Brill Co., Philadelphia	300	Truck bodies, Type B
	125	Truck bodies, Type A
Hopkins Mgf. Co., Hanover, Pa.	200	Truck bodies, Type B

Parts and Assemblies Class B Standard Motor Trucks

Name and Location	Quantity	Item
Continental Motors Corp., Detroit	6,400	Engines
Wisconsin Motor Co., Milwaukee	,000	Engines
Waukesha Motor Co., Waukesha	2,000	Engines
Hinkley-Motor Corp., Detraoit	1,200	Engines
Timken-Detroit Axle Co., Detroit	5,000	Sets Axles
Sheldon Axle Co., Wilkes-Barre	2,500	Sets Axles
American Ball Bearing Co., Cleveland	2,000	Sets Axles
Covert Gear Co., Lockport, N. Y.	5,000	Transmissions
Warner Gear Co., Muncie, Ind.	4,000	Transmissions
T. W. Warner Co., Muncie, Ind.	2,000	Transmissions
Muncie Gear Co., Muncie, Ind.	1,000	Transmissions
Covert Gear Co., Lockport, N. Y.	4,000	Clutches
Warner Gear Co., Muncie, Ind.	4,000	Clutches
Detroit Gear & Machine Co., Detroit	4,000	Clutches
Covert Gear Co., Lockport, N. Y.	5,000	Controls
Warner Gear Co., Muncie, Ind.	6,000	Controls
Dayton Engineering Laboratories Co., Dayton	10,000	Generators
Bijur Motor Lighting Co., Hoboken	2,000	Generators
Eisemann Magneto Co., Brooklyn, N. Y.	5,000	Magnetos
Splitdorf Electrical Co., Newark	3,000	Magnetos
Ericsson Mfg. Co., Buffalo	2,000	Magnetos
Remy Electric Division, United Motors Corp., Anderson	12,000	Distributors and coils
Kellogg Switchboard & Supply Co., Chicago, Ill.	12,000	Switches
Splitdorf Electrical Co., Newark	500	Magnetos
C. A. S. Products Co., Columbus	2,500	Steering gears
Warner Gear Co., Muncie, Ind.	3,000	Steering gears
Ross Gear & Tool Co., Lafayette, Ind.	1,000	Steering gears
Gemmer Mfg. Co., Detroit	5,000	Steering gears
Fedders Mfg. Co., Buffalo	2,000	Radiators
McCord Mfg. Co., Detroit	2,000	Radiators
National Can Co., Detroit	1,000	Radiators
Perfex Radiator Co., Racine	1,000	Radiators
Long Mfg. Co., Detroit	4,000	Radiators
English & Hersick Co., New Haven	1,000	Radiators
G. & O. Mfg. Co., New Haven	1,000	Radiators
Rome-Turney Radiator Co., Rome, N. Y.	1,000	Radiators
Savage Arms Corp., Sharon, Pa.	2,500	Frames
A. O. Smith Corp., Milwaukee	2,000	Frames
The Hydraulic Pressed Steel Co., Cleveland	2,000	Frames
Detroit Pressed Steel Co., Detroit	2,000	Frames
Parish & Bingham Co., Cleveland	2,000	Frames
Detroit Steel Products Co., Detroit	4,000	Springs (front)
	4,000	Springs (rear)
Standard Parts Co., Cleveland	8,000	Springs (front)
	6,000	Springs (rear)
The Mather Spring Co., Toledo	6,000	Springs (front)
	6,000	Springs (rear)
Sheldon Axle & Spring Co., Wilkes-Barre	4,000	Springs (front)
	4,000	Springs (rear)
Cleveland Canton Spring Co., Canton, Ohio	4,000	Springs (front)
	4,000	Springs (rear)
Schwarz Wheel Co., Philadelphia	500	Sets steel wheels (40 x10)
Hayes Motor Truck Wheel Co., St. Johns, Michigan	2,700	Sets wheels
Standard Wheel Co., Terre Haute, Ind.	300	Sets wheels
Auto Wheel Co., Lansing	500	Sets wheels
Prudden Wheel Co., Lansing	250	Sets wheels
Dayton Steel Foundry Co., Dayton	1,250	Sets wheels
Michigan Malleable Iron Co., Detroit	750	Sets steel wheels (40 x10)
Standard Steel Castings Co., Cleveland	2,000	Sets steel wheels (40 x10)
Dayton Steel Foundry Co., Dayton	1,000	Sets steel wheels (40 x10)
Michigan Malleable Iron Co., Detroit	250	Sets steel wheels (40 x12)
Standard Steel Castings Co., Cleveland	1,500	Sets steel wheels (40 x12)
Otis Elevator Co., New York, N. Y.	150	Sets steel wheels (40 x12)
	100	Sets steel wheels (40 x10)
Prudden Wheel Co., Lansing	500	Sets wood wheels
Bimel Spoke & Auto Wheel Co., Portland, Ind.	500	Sets wood wheels

Name and Location	Quantity	Item
Hayes Mfg. Co., Detroit	8,000	Seat Assemblies
C. R. Wilson Body Co., Detroit	3,000	Seat Assemblies
Michigan Stamping Co., Detroit	8,000	Dashes
International Metal Stamping Co., Detroit	3,000	Dashes
International Metal Stamping Co.	5,000	Hoods
Hayes Mfg. Co., Detroit	6,000	Hoods
	11,000	Fenders (pairs)
	5,000	Fan shrouds
Michigan Stamping Co., Detroit	6,000	Fan shrouds
Geuder, Paeschke & Frey, Milwaukee	5,500	Feed tanks
	5,500	Reserve tanks
Kardell Bros. Co., Utica, N. Y.	5,000	Feed tanks
	5,000	Reserve tanks
Hartford Auto Parts Co., Hartford	2,000	Universal joints, rear
Kinsler-Bennet Co., Hartford	2,000	Universal joints, front
Peters Machine & Mfg. Co., Cleveland	2,500	Universal joint assemblies
Spicer Mfg. Corp., Plainfield	4,000	Universal joint assemblies
Universal Machine Co., Bowling Green, Ohio	3,500	Universal joint assemblies
Philadelphia Storage Battery Co., Philadelphia	2,000	Batteries
Prestolite Co., Indianapolis	3,000	Batteries
U. S. Light & Heat Corp., Washington	2,500	Batteries
Vesta Accumulator Co., Chicago	2,000	Batteries
Utility Battery Co., Chicago	1,000	Batteries
Willard Storage Battery Co., Cleveland	2,500	Batteries
Detroit Battery Co., Detroit	1,000	Batteries
Guide Mtr. Lamp Mfg. Co., Cleveland	2,500	Sets lamps
Edmunds & Jones Corp., Detroit	3,000	Sets lamps
C. M. Hall Lamp Co., Kenosha	4,500	Sets lamps
Indiana Lamp Co., Connersville, Ind.	1,500	Sets lamps
Barbee Wire & Iron Works, Lafayette, Ind.	3,000	Radiator guards
Buffalo Pitts Co., Buffalo	2,000	Radiator guards
Stewart Iron Wks. Co., Cincinnati	2,000	Radiator guards
Gier Pressed Steel Co., Lansing	3,000	Radiator guards
Van Dorn Iron Wks., Cleveland	2,000	Radiator guards
Michigan Stamping Co., Detroit	6,000	Dust pans
J. W. Murray Mfg. Co., Detroit	5,000	Dust pans
H. W. Johns-Manville Co., New York	2,000	Odometers
Stewart-Warner Speedometer Corp., Chicago	10,000	Odometers
Schweppe & Wilt Mfg. Co., Detroit	3,000	Reach rods
Michigan Plant Steel Products Co., Detroit	5,000	Reach rods
Cincinnati Ball Crank Co., Oakley, Cincinnati	3,500	Reach rods
Schweppe & Wilt Mfg. Co., Detroit	2,500	Sprag assemblies
Gier Pressed Steel Co., Lansing	2,500	Sprag assemblies
Detroit Pressed Steel Co., Detroit	2,500	Sprag assemblies
Stewart Iron Wks., Cincinnati	3,000	Sprag assemblies
Thompson Mfg. Co., Des Moines	3,500	Sprag assemblies
Michigan Plant Steel Products Co., Detroit	7,000	Crank assemblies
Stromberg Motor Devices Co., Chicago	1,250	Carbureters
Zenith Carbureter Co., Detroit	1,250	Carbureters
Stromberg Mtr., Chicago	8,300	Carbureters
Mich. Stamp. Co., Detroit	6,000	Bumpers
Salisbury Wheel & Axle Co., Jamestown, N. Y.	5,000	Bumpers
Gramm-Bernstein Mtr. Truck Co., Lima, Ohio	1,000	Assemblies
Kelly-Springfield Mtr. Truck Co., Springfield, Ohio	500	Assemblies
Indiana Truck Corp., Marion, Ind.	500	Assemblies
Service Mtr. Truck Co., Wabash, Ind.	500	Assemblies
Republic Mtr. Truck Co., Alma, Mich.	1,000	Assemblies
Pierce-Arrow Mtr. Car Co., Buffalo	1,000	Assemblies
Selden Truck Sales Co., Rochester	1,000	Assemblies
Bethlehem Motors Corp., Allentown	700	Assemblies
Diamond T. Motor Car Co., Chicago	500	Assemblies
	150	Assemblies
United States Mtr. Truck Co., Cincinnati	500	Assemblies
Brockway Mtr. Truck Co., Cortland, N. Y.	500	Assemblies
	150	Assemblies
Velie Mtrs. Corp., Moline	500	Assemblies
Sterling Mtr. Truck Co., Milwaukee	500	Assemblies
Garford Mtr. Truck Co., Lima, Ohio	1,000	Assemblies
Oldberg Mfg. Co., Detroit	3,000	Mullers
Michigan Stamp. Co., Detroit	2,000	Mullers
Gemco Mfg. Co., Detroit	3,000	Mullers
Xardell Brothers Co., Utica	3,000	Mullers
Standard Parts Co., Cleveland	5,000	Drawbar assemblies
Savage Arms Corp., Sharon, Pa.	3,000	Drawbar assemblies
Salisbury Wheel & Axle Co., Inc., Jamestown, N. Y.	3,000	Drawbar assemblies
Steel Products Co., Cleveland	8,000	Rear spr. shackle pins
	8,000	Rear spr. frt. brack. pins
	24,000	Frt. spr. hangers and shackle bolts
	8,000	Engine support bolts (front)
	22,000	Engine support bolts (rear)
Brown Co., Syracuse	7,000	Rear spr. shackle pins
	7,000	Rear spr. frt. brack. pins

Name and Location	Quantity	Item
Brown Co., Syracuse	21,000	Frt. spr. hangers and shack. bolts
	9,000	Frt. spr. hangers and shack. bolts
	7,000	Engine support bolts
	7,000	Brake equal. lever pins
	5,000	Rear spr. shackle bars
Michigan Screw Co., Lansing, Mich.	15,000	Brake equal. lever pins
	7,000	Spring shackle pins 7414-V
	7,000	Rear spr. frt. brack. pins
	7,000	Engine support bolts
Columbia Axle Co., Cleveland	6,000	Rear spr. shackle bars
Standard Parts Co., Cleveland	5,500	Sets rear spr. shack. sub.-assem.
National Machine Products Co., Detroit	5,500	Sets rear spr. shack. sub.-assem.
E. A. Laboratories, Inc., New York	12,000	Warning signals
General Mtrs. Corp., Flint	5,500	Transm. frt. hangers
Standard Parts Co., Cleveland	5,500	Transm. frt. hangers
General Mtrs. Corp., Flint	11,000	Spr. shac. forgings
Standard Parts Co., Cleveland	11,000	Spr. shac. forgings
General Mtrs. Corp., Flint	5,500	Engine supports
Standard Parts Co., Cleveland	5,500	Engine supports
Massnick Mfg. Co., Detroit	6,000	Steering gear frame brackets
	6,000	Steering gear frame brack. caps
	6,000	Intermed. brake shaft brack.
Standard Parts Co., Cleveland	5,000	Intermed. brake shaft brack.
National Machine Products Co., Detroit	5,000	Steering gear frame brackets
	5,000	Steering gear frame brack. caps
Union Forging Co., Union, N. Y.	40,000	Minor parts
Sterling Mtr. Truck Co., Milwaukee	103,000	Minor parts
	24,000	Minor parts
Indiana Mtr. Truck Co., Marion, Ind.	147,000	Minor parts
Gramm-Bernstein Mtr. Truck Co., Lima	257,000	Minor parts
Cleveland Hardware Co., Cleveland	82,000	Minor parts
Standard Parts Co., Cleveland	520,000	Minor parts
Stewart Iron Works, Cincinnati	110,000	Minor parts
Gramm-Bernstein Mtr. Truck Co., Lima, Ohio	5	Complete assem. minor parts
	515	Minor parts
Empire Brass Mfg. Co., Cleveland	6,000	Gas reserve tank drain cocks
Metal Forming Corp., Elkhart, Ind.	5,000	Exhaust pipes
Standard Brass Wks., Detroit, Mich.	5,000	Gas reserve tank drain cocks
	11,000	Radiator drain cocks
Cook Springs Co., New York, N. Y.	11,000	Springs, brass wire
Burton Lowery Co., Detroit	4,000	Sets upholstery
J. C. Wilson Co., Detroit	3,000	Sets upholstery
Briggs Mfg. Co., Detroit	2,000	Sets upholstery
American Auto Trimming Co., Detroit	2,000	Sets upholstery
Walker Mfg. Co., Racine, Wis.	4,000	Sets upholstery
Keeler Brass Co., Grand Rapids, Mich.	500	Sets jacks
	4,500	Sets brass hood fast
Columbus Auto Parts Co., Grand Rapids	3,000	Sets hood fast., mall. iron
Hancock Mfg. Co., Charlotte, Mich.	3,000	Sets hood fast., steel
Hughes & Curren Co., Rochester	3,000	Stes hood fast., steel
Briggs Mfg. Co., Detroit	3,000	Cape tops
Anchro Top & Body Co., Cincinnati	3,000	Cape tops
American Auto Trimming Co., Detroit	3,000	Cape tops
		Cape tops
Gramm-Bernstein Mtr. Truck Co., Lima	250	Sets spark and throt. control assem.
Standard Parts Co., Cleveland	5,000	Sets spark and throt. control assem.
National Machine Products Co., Detroit	6,000	Sets spark and throt. control assem.
Standard Brass Works, Detroit	5,000	Gas feed pipe shut-off cocks
American Brass & Iron Co., Detroit	6,000	Gas feed pipe shut-off cocks
Packard Electric Co., Warren, Ohio	4,500	Sets wiring assem.
Remy Electric Division United Mtrs. Corp., Anderson, Ind.	4,500	Sets wiring assem.
Barcy Nicholson Co., Detroit	2,000	Sets wiring assem.
Dover Stamping & Mfg. Co., Cambridge	11,000	Funnels
Gray & Davis, Inc., Boston	11,000	Light bulbs, cases
National Can Co., Detroit	10,000	Water cans
Chicago Raw Hide Mfg. Co., Chicago	10,000	Fan belts
Graton & Knight Mfg. Co., Worcester, Mass.	10,000	Fan belts
Crowe Name Plate & Engraving Co., Philadelphia	10,500	Name plates
Champion Ignition Co., Flint	100,000	Spark plugs
Vicheck Tool Co., Cleveland, Ohio	11,000	Sets tool bag equip.
	11,000	Wrenches, brake adj.
	3,000	Wrenches, worm
	6,000	Wrenches, tappet
	3,000	Valve lifters
	3,000	Wrenches, spr. clip, open end, 1 in.
	3,000	Wrenches, spr. clip, open end, ¾ in.
	3,000	Handles, pipe, galv., 16 in. long
	3,000	Gauges, valve tappet, etc.
	3,000	
Standard Parts Co., Cleveland, Ohio	6,000	Gas. feed pipe, sub-assemblies
Imperial Brass Co., Chicago, Ill.	5,000	Gas. feed pipe, sub-assemblies
Cook Spring Co., New York, N. Y.	11,000	Radiator foot bolt springs
	11,000	Brake rod springs
	11,000	Start. crank catch brack. springs

N.A.C.C. Forms Motor Truck Division

Two Classes of Membership Provided

NEW YORK, March 15—The motor truck has been placed in a division of its own by the National Automobile Chamber of Commerce, and hereafter there will be two classes of membership, a truck division and a passenger car division, with two second-vice-presidents in charge, Windsor T. White in charge of the truck classification and H. H. Rice in charge of passenger cars.

The motor truck has been held in subjection by the organization since its inception, and there has been much uneasiness among many truck makers for this reason these several years. A national truck organization has been discussed at truck meetings recently, and the motor truck program mapped out seems a natural result.

The motor truck show is to be recognized, though no definite announcement has been made. Regular meetings of representatives of the forty-five commercial vehicle manufacturing companies included in the N. A. C. C. membership will be held frequently. Many truck makers have been admitted as new members during the last year, and one of the principal objects of the regular sessions will be to promote greater personal acquaintance among them and afford opportunities for discussing their particular problems, such as the passenger car makers have had for many years.

A resolution was passed for the chairman to appoint a committee of three to investigate and report upon plans for selling motor trucks on the time-payment basis, the consignments of motor trucks to dealers and the consignment of parts to dealers.

M. & A. M. TO CARRY ON

(*Concluded from page* 15)

tional Automobile Chamber of Commerce a willingness to co-operate with them at any time where our mutual interests are concerned.

"We believe the interests of both associations can now best be served by separate representation although we are confident that the work of the joint committee was wise in the beginning."

A letter also was sent to the Ford Motor Co., extending the appreciation of the association for the work done by Mr. Lee as representative of the Ford company on the Automobile Industries Committee.

The association some time ago appointed an alien labor committee with Albert Champion as chairman, assisted by W. C. Rand and George Edmonds, which committee is ready to submit plans and suggestions for educational co-operation on the part of all members of the association. This matter is of such importance that the complete plan is to be laid before the membership at the next meeting.

The show committee of the association under the direction of William E. Sweet, chairman, is investigating the attitude of tractor manufacturers toward the Motor & Accessory Manufacturers' Association, as regards its assisting in tractor shows, the same as the association has co-operated with regard to motor car shows.

MOTOR PRODUCTS EARNINGS

Detroit, March 15—Earnings of the Motor Products Corp. during the year ending Dec. 31, 1917, amounted to $537,527.67, of which $233,333 already has been paid in dividends. Sales for the year have amounted to $9,633.082, an increase over a previous period of $3,153,506, or 48.6 per cent. This increase does not include any Government or war orders and covers a term in which the corporation's affairs were consolidated by bringing four of its manufacturing plants into the newly acquired Lozier plant. No provision has been made in the earnings for Federal taxes, and it is estimated that they will be between $80,000 and $100,000.

Government business for the future has been obtained to the amount of $5,500,000, and orders for new business total $2,000,000.

Looking down one of the aisles at the Rothschild exhibition. The aisle is half a city block long

Store Stages Accessory Show

Large Chicago Concern Displays Motor Car Fitments with 192 Exhibitors Using Space

CHICAGO, March 18—A department store staging a motor car accessory show is not an every-day occurrance. Yet this is exactly what Rothschild & Co., one of Chicago's largest department stores, is doing this week. Saturday, the opening day, was a decided success. The attendance was large, being one of the biggest days in the history of the store. The crowd bought freely, consequently the sales were excellent.

Having profited by the experience of the two previous shows, the arrangement of booths is much better this year than last. This show combines the exhibition features of the national motor car shows and the merchandising methods of a large department store, which makes an excellent combination from the standpoint of business done. The entire store profits from the advertising of the accessory show as the other departments throughout the store also gain on account of the increased crowd. Other large stores in the city took advantage of the opportunity and conducted special sales in their accessory departments Saturday.

As a whole the show is larger than last year, having 192 exhibitors, sixty-seven more than last year. This year's show also covers more space than any of the previous shows.

A minature refining plant illustrating the production of lubrication oil is one of the features of the show. This is used to display Havoline oil. All the apparatus for this exhibit was built in the Rothschild shops. The manufacture of Ehman tires is shown in one booth where two operators are working making tires. By these means all of the steps in the manufacture of tires is shown. One new device for registering the oil level in a Ford engine so that it can be observed from the dash is shown. Much interest was displayed by the crowd in the booths where accessories were being sold at a low price. Some of these were lubricating oil, tires, spotlights, storage batteries, Ford parts, etc.

All types of accessories are shown. Sales of seat covers, batteries, non-glaring lenses, jacks, tires, lubricating oils, etc. were heavy during the first day. Throughout the first day the aisles in the accessory department were crowded and practically all the booths reported excellent sales.

Patriotic emblems formed the decorations for many of the booths, while flags were suspended from above at the department store's show

Rothschild & Co. own all the accessories exhibited. The plan of the sale is to have the goods sold by a Rothschild salesman who is assisted by a factory representative making demonstrations of the article. The fact that the salesman receives a bonus of 2 per cent of all the sales that he makes stimulates interest and assists in increasing the amount of business done.

G. R. Israel and S. E. Gross, executives in charge of the accessory department, stated that Saturday's crowd was one of the largest their department had ever had. This also applies to the other departments where the crowds were much larger than is customary on Saturday afternoons. Business in general throughout the store also increased due to the crowd drawn by the accessory show.

BOLLSTROM LEASES PLANT SITE

South Bend, Ind., March 16—The Bollstrom Motors Co., whose headquarters are in Detroit, has bought 55 acres of ground and leased more than 100 acres in the west part of Marion, Ind., for a plant to manufacture motor trucks and truck and field tractors under the Bollstrom patents. The company is incorporated for $3,000,000. Guy Hamilton is general manager. The company will employ 2,500 workers.

NEW TIRE CONCERN BEGINS

South Bend, Ind., March 18—The International India Rubber Corp., which was organized here about Jan. 1, 1916, commenced operation here to-day. Peter E. Studebaker, son of Henry Studebaker, one of the founders of the Studebaker Bros. Mfg. Co., now the Studebaker Corp., has been president of the corporation since its organization. George Odell is secretary and general manager. The corporation has a capitalization of $1,000,000. It has a factory containing 30,000 sq. ft. of floor space, equipped with machinery for manufacturing tires.

STUDEBAKER ADVANCES PRICES

Detroit, March 18—Prices on Studebaker commercial cars have been increased $100 right through the list. The reason assigned is the advanced cost of materials with increased manufacturing charges. Some of the detailed instances given by R. T. Hodkns, general sales manager of the Studebaker Corp., are frame steel formerly $1.25 per hundredweight in 1916, now $4, an advance of 270 per cent. Sheet steel, which cost $2.75, now sells for $7, an advance of 155 per cent. Aluminum castings, which cost 28 cents a pound, now are 50 cents a pound, an advance of 70 per cent. Cast iron for cylinders and other engine parts formerly $13.25 a ton, is now $43 a ton. In addition to those it is stated that leather has gone up 40 per cent, cotton fabric for tires 150 per cent, rubber 75 per cent, wheels 80 per cent, and copper 100 per cent.

New prices of the Studebaker Commercial cars are: Half-ton models, panel delivery, $1,085; express, $1,060; station wagon, $1,095; chassis, $1,045; 1-ton models, stake body, $1,550; express, $1,500; sixteen-passenger bus, $1,700; hearse chassis, $1,600; chassis, $1,400.

New Records for Ascot

Milton Wins George Washington Sweepstakes and Blinkey Ben on Coast

Two Upsets Without Injury Furnish Thrills

LOS ANGELES, Cal., March 18—Special telegram—In the most spectacular exhibition of driving ever seen on the course, Barney Oldfield, Eddie Hearne and Tom Milton established new records for Ascot speedway in the Blinkey Ben and George Washington sweepstakes races here yesterday, won by Milton. The crowd was thrilled as never before when the cars driven by Fred Horey and Louis Le Couq turned over in each instance, throwing the drivers clear and subsequently being driven to the starting line under their own power only slightly damaged and the drivers unharmed except for a few scratches. The races were conducted by W. H. Pickens and if they indicate what may be expected during the coming season from events that are without A. A. A. or other jurisdiction, the public will have to take its chances. Pullen and Harding, who were advertised as starters, did not appear. Horey, who had been proclaimed the world's champion dirt track driver, was on hand and when starting time arrived 30 min. late was said to be without a car. Oldfield lent him the Golden Submarine and it was at the wheel of this car that he came to grief. The fast driving and sensational spills alone saved the management from criticism. As it was, everybody seems satisfied for the day. In qualifying for the Blinkey Ben 1-mile dash, Eddie Hearne, in Louis Chevrolet's Frontenac, clipped ⅗ sec. off Oldfield's former record of 45 sec. for the course. Oldfield came back then and in his qualifying round put the mark down to 44 sec. flat, said to be a new record for a mile speedway. Milton won the race from Oldfield, Hearne, Le Couq, Durant and Mais by snatching the pole from Barney at the start and never being headed. His mark was 44⅘ sec. under mile competition record. The George Washington sweepstakes was for 30 miles run in three heats 10 miles each. Rather than disappoint the crowd, Oldfield lent Horey his car for this race. Horey, Hearne, Milton, Le Couq, Durant and Mais started. Horey set out in the strange car to make good for the publicity limelight he had occupied and set the pace. In the third lap, when coming down off the bank, he lost control of the car. It plunged through the rail into the plowed safety zone and rolled over, throwing Horey free. Milton won the heat in 7:41, 3 sec. faster than Louis Chevrolet's 10-mile record for Ascot. In the second heat, Milton was pacemaker closely followed by Hearne and Le Couq. Twice Milton and Hearne pocketed Le Couq and it took great driving on the part of the youngster to escape an accident each time. In the fourth lap he was right on Milton's rear wheels with Hearne, but a few feet behind him. At almost the identical spot where Horey turned turtle, Le Couq went over, his car doing a header then rolling over sideways. He lay stunned for an instant, the car pinioning one arm, but spectators quickly released him and found he was unhurt. Milton won this and the subsequent heat in easy fashion.

MARMON 34 COSTS MORE

Indianapolis, Ind., March 18—Prices on the Marmon 34 open cars were advanced $200 to-day. New and old prices are as follows:

BODY	OLD PRICE	NEW PRICE
7-pass. touring	$3,550	$3,750
4-pass. roadster	3,550	3,750
5-pass. touring	3,500	3,700
Chassis	3,250	3,450

No changes are announced on the closed models.

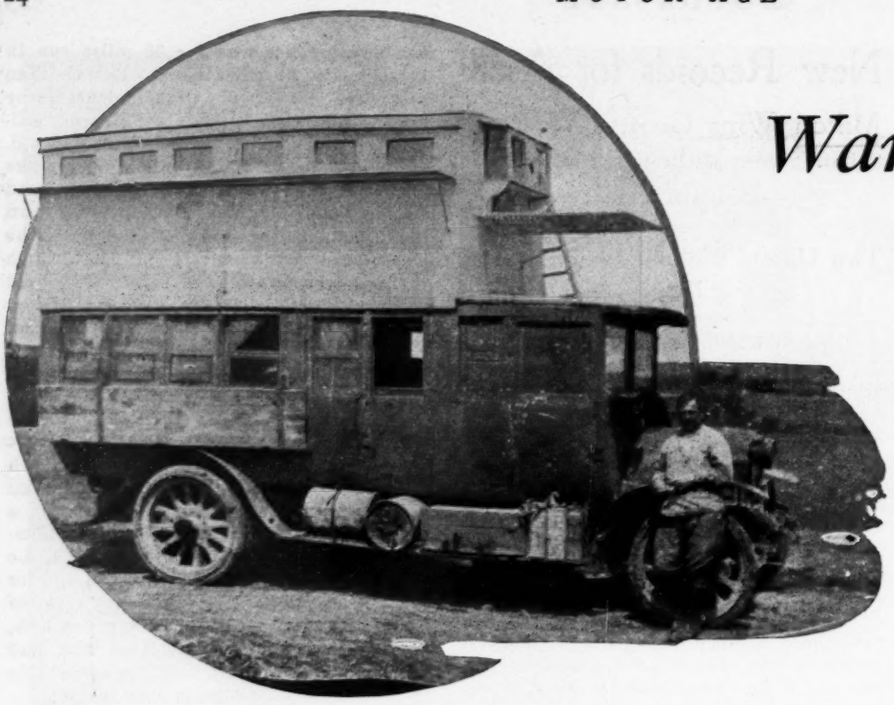
WILL DRIVE FORTY MARMONS

Indianapolis, Ind., March 15—Forty cars will leave here Sunday for New York in the first large driveaway ever held by Nordyke & Marmon. The cars will go by Columbus, Pittsburgh and Philadelphia over the Lincoln highway. Last year the New York agency drove away fifteen or twenty cars but got most of what it wanted by rail. Driveaways are the only solution apparently this year, and drivers are hard to get.

This miniature oil field attracted many of the crowd to the motor car accessory exhibition at the large Chicago department store

War in the Air

By Robert A. Drake



Motor truck carrying 110 carrier pigeons for bringing messages back from front-line trenches in France. This is 6 miles back from the lines. The pigeons are carried up to the trenches in baskets

THE first indication that we were drawing near the zone of shell-whistles was the line of captive balloons that dotted the sky 3 or 4 miles behind the front-line trenches. As we drew nearer, the dots seemed to change in shape to great floating cigars; still nearer, the cigars changed to huge floating elephants with two bulbous growths on each side of their heads. The basket from which the observer was watching Boche-land so interestedly seemed to be entirely disconnected from the balloon itself, for the suspension ropes were too small to be visible. As the breeze caught the light fabric of the great bag, the sausage swung to and fro in the air like a huge boat tethered in the swiftly flowing current of a river.

Dirigibles Not at Front

The dirigibles that I read so much about at home were never seen at the front, for the slow moving balloons stood no chance against the fast German airplanes that came back of the French lines. The captive balloons were attached to a steel cable that could be pulled in quickly in case a German avion came over, but the airplanes shot down many of the balloons in spite of all the balloonists could do.

At the front our main camp was often directly under the glistening French balloons, and in the distance I could see the motionless black specks of the German sausages staring down out of the sky like the evil eyes of a monster. In a hot sector like the Chemin des Dames, the sausages, both German and French, dotted the sky with such frequency that the line of battle easily was located merely by drawing an imaginary line between the two rows of balloons.

As soon as the ambulances left the French sausages behind them, we knew we were well up toward the lines and that we might expect shells to drop on the road at any moment. In one place a German airplane passed directly over my head as I went up toward the front. Suddenly the sausage that the German was hunting came sailing swiftly down out of the air as the men below hauled in the cable, and the balloon kept dropping until the white puffs of shrapnel smoke drove the German back toward his lines. As soon as the balloonist saw the Boche going home, he signalled for men below to send him up again; but the German made a sharp turn in the air and came back for the balloon. So down came the sausage again—and this bobbing up and down took place three times before we had reached the *poste*.

Another time when a German airplane came near a French balloon, a great cloud of milky white vapor suddenly shot out from the bag.

"The balloon's shot down!" Wally cried, but the sausage remained stationary in the air and the avion flew home.

"That smoke did not have anything to do with airplane," Ducky explained. "That Boche wasn't near enough to do any harm. The man in the balloon was just letting out a little gas to relieve the pressure on the envelope. The hydrogen gas that they use has expanded so much since the sun came out from behind that cloud that the pressure was dangerous, so the man pulls a rope that opens the valve."

A Frenchman who had been talking with us nodded his head in agreement and continued on the subject of sausages. He told us how the Frenchmen had tried to use a German captive balloon that had broken loose from its cable and drifted over in the French territory, but the Germans recognized their old friend and gave him no rest. They harassed that particular balloon without mercy from morning till night; they sent over a squad of airplanes that punctured the bag in a hundred places, and sent it to earth in a cloud of flames and smoke.

Balloons Controlled on Ground

Near the *poste de secours* of Brenelle a balloon section had its camp, so I learned how the balloons were manipulated from the ground. The cable was attached to a huge windlass driven by gasoline power and mounted on a motor truck that was heavy enough to tether the balloon when it was in the air. Every morning at 8 o'clock and every evening at twilight I heard the clank of the huge drum as it wound up and unwound the cable, and I saw the shadowy form of the sausage sailing up and down. The wind always blew the sausages so that the cables made at least an 80-deg. angle with the ground, and to eliminate the possibility of a collision between the French airplanes and the cable, two or three banners

Field hospital on the move. The surgical instruments are carried on the truck and the collapsible tent for the hospital is packed on the trailer. Such a hospital goes within 3 or 4 miles of the front

were tied to the cable at intervals of 50 ft. below the balloon.

The balloonists lived in a wonderful dugout that the Germans had carved out of solid rock, and the comforts of home in that *abris* included even a well-tuned piano.

In the basket of every balloon was either a machine gun or a rifle to protect the observers against the German airplanes which fired on them, and also a parachute for the observer in case the bag was exploded. Only commissioned officers manned the sausages, because the information obtained was so important. But the officers didn't relish their jobs a good many times.

Everybody knows the sensation one has when one rides up and down on an express elevator, and the speed with which the balloon went up and down was much faster than the swiftest elevator. Even after the balloon was in the air the swaying and rolling motion was more than sufficient to make the most seasoned mariner deathly seasick.

The hydrogen used to inflate the sausages was brought to the front in long steel cylinders that looked exactly like the tanks druggists use to charge the soda fountains in the United States.

Rain Delayed Work

During the middle of August the continual rain handicapped the work of the balloonists to a great extent, so the observers seized every opportunity to send their bag sailing skyward. One morning about 10 o'clock the clouds broke, and the sausage near our camp went up. I saw the balloon rising from the woods, but the sight was now so familiar to me that I never glanced at it a second time until I heard a call from the road.

"Come here, quick!" Wally cried. "The Boches are after the balloon!"

I ran out into the street just in time to see the gleaming body of a German airplane slip quickly out of a low-hanging cloud and attack the sausage with its machine gun. Two French airplanes were circling in the air in the near distance, but the attack was so sudden that they had no time to drive the German away. Puff! A flash of fire and a cloud of smoke drifted from the spot where the balloon had been a moment before, and out of the murky cloud a tiny dot dropped swiftly. Then the white parachute opened like a great umbrella and checked the observer's descent. By the time the smoke had drifted away the avion had slipped into the clouds again and vanished. The observer by now had reached the ground, cut himself loose from the ropes and walked back to his camp to write out an order for another balloon.

But the French were not the only ones to have their sausages destroyed. Just after the section had passed through Epernay on convoy, I learned of a German sausage that had broken loose from its cable and had drifted far into the interior of France. Just as this balloon was over the Marne river, a squadron of French airplanes, not understanding the mysterious appearance of the sausage and thinking that perhaps it was going to drop bombs on the town, attacked the balloon and set it on fire. The observer jumped—he had not left his basket before probably because he had hoped that the wind would change to blow him back toward his native land—and he fell directly into the current of the river. When he landed in the water the ropes of the parachute became tangled around his arms and legs, and before the Frenchmen could send out a boat from the shore the man had drowned.

But I lost any sympathy I ever felt for that Boche when I learned the tactics of the German balloonists, for it was these observers that had telephonic connection with the batteries that shot on the roads where the ambulances traveled. Nothing could have been more merciless than the very appearance of those balloons. As the road wound up toward the trenches one of these great "eyes of the army" hovered in every gap of the hills. I could picture the German in the balloon sending a sequence of numbers to the waiting battery below, numbers that told the exact instant that the guns, which already were aimed at certain cross roads, should fire to hit the oncoming ambulance. Then, perhaps, the German sent down another number to correct the range in case of a poor shot, for the black smoke of the exploding shells made it easy for the observer to tell where the marmites had hit. Often it was not roads that the balloons watched so much as the bridges. In spite of the dead green paint that the Frenchmen covered the spans with to make them the color of the water below and in spite of the screens between the bridges and the balloons, the shells landed very near their target.

Whether I drove over bridges or up shelled streets, the policeman at the last corner before the exposed stretch of road always signalled "slow up," because if the car drove fast the cloud of dust called the attention of the balloonist to the vehicle.

Often we had long discussions as to whether the Germans saw the Red Crosses on the cars. Some of us maintained that the Boches could distinguish the crosses perfectly and ordered the artillerymen to shoot despite the theoretical protection the symbol was supposed to give.

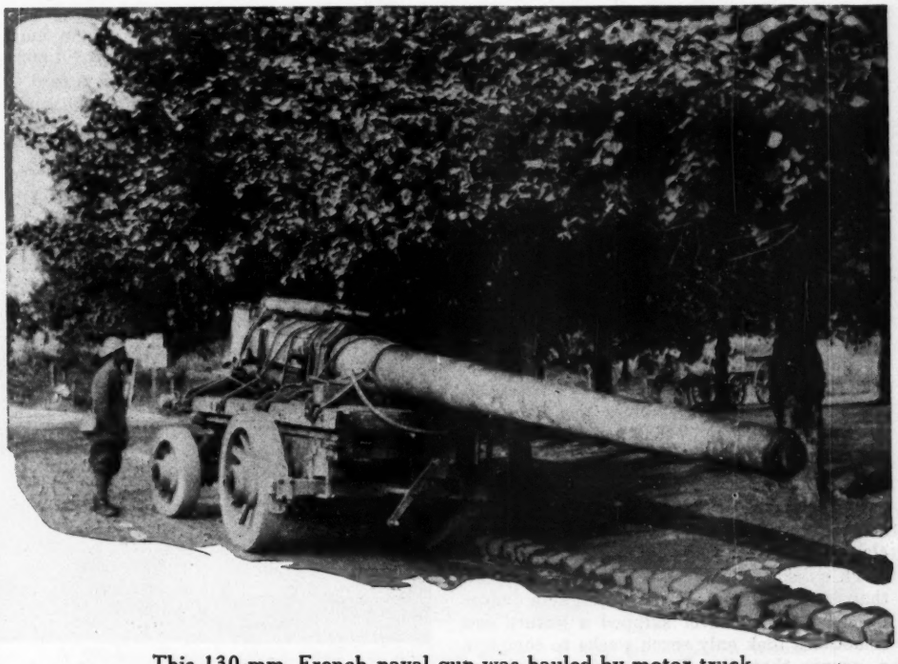
For five months I wondered why the balloons were not shot at by the large French and German guns, but I soon realized that the balloons were so far away and consequently presented such tiny targets to the gunners it was practically a waste of ammunition to try to shoot them down. Once I did see one enormous French naval gun over 30 ft. long that had been brought to the front for the special purpose of trying to knock down the balloons that watched the bridge at ————.

"This gun shoots over 12 miles," the artilleryman told me, and I realized then the true difficulty of hitting a balloon. When I considered that the shell when it left the gun traveled so fast that it hardly could be seen, I realized what a finely adjusted time fuse was necessary to explode the shell at the exact instant that it passed the sausage.

Less than a week after the balloon gun had been making sleep impossible for us, I saw that the Germans were retaliating by shooting at a French sausage. I was not more than half a mile away from the balloon when a great yellowish-white puff of shrapnel smoke appeared in the air 200 yd. from the basket, but instead of fearing the shells would force the sausage to come down, I found myself merely wondering at the accuracy that allowed the Boches to explode the shrapnel as near as they did.

Ceaseless Air Activity

Some inkling of the life of the aviators that flew over these sausages was gained through the men in the section who either had joined the aviation section or who had relatives already in that branch of the service. Campy and Joe were two who left the ambulance service for aviation, and they were good examples of the type that makes the best aviators. They were both of a temperament that demanded ceaseless activity instead of the alternately hard work and then complete rest of the ambulance drivers, and they were men who either had close relatives already fighting for France and England or men who had practically no family ties to bind them. Every time a man left camp to join the aviation service, the other men of the section felt a vague sense of unrest and discontent that was hard to



This 130-mm. French naval gun was hauled by motor truck. It is unusual that so large a gun is used for shrapnel firing

High-speed, single-man French Nieuport fighting plane with speed of 130 to 140 m.p.h. The photograph was taken April, 1917

fathom. It was probably because they hated to see their old friends leaving them, and also because these changes always happened during *repos* when enforced rest was much harder to endure than the more dangerous work at the front. But the type that made a success of aviation seemed to change in a short six months from the adventure-loving men who liked aviation because of the thrill it gave them to quiet youths who took aviation up as seriously as ever a medical student studied his profession.

Making Good as Flyers

When I first went abroad, I heard many stories about men who, forced to leave one service, finally entered aviation to make good flyers. One English boy who had committed the unpardonable crime of striking his superior officer later acquitted himself by his bravery in the air. Another chap who was not allowed to join the ambulance service because of his fondness for drink proved himself to be an excellent aviator. Two other men who were already in the aviation service were caught under the influence of liquor in a Paris café and sent as a punishment from the school of fast pursuing planes to the school of slow observation planes. As these boys had been doing excellent work and were the most probable candidates for a fast Spad, this transfer was indeed a punishment, but the two men worked so faithfully at the observation plane school that they finally were transferred back to the school of chasseurs again.

Strict physical training was the rule for the aviators. Tobacco, liquor, late hours and irregular meals all were given up by the men training seriously to fly. Puritanical severity in regard to morals was observed, in spite of the fact that frequent permissions were given the men to go to Paris.

The Americans in the French aviation schools, according to what one of the instructors said in the presence of his mixed class of Frenchmen and Americans, were much quicker and more faithful in the work than the natives. The foreigners never missed a flight, never skipped a lecture and sometimes took only seven weeks to complete a course that the Frenchmen studied for three and six months.

A young fellow who had once been an ambulance driver in Section Seven of the American Red Cross Ambulance Service landed in a field near camp one afternoon and gave some interesting information about the famous Guynemer, who has been reported missing recently. Guynemer always had the fastest French airplanes available, and he carried on his machine a 37-mm. shrapnel gun in addition to the ordinary machine gun. This famous aviator, who had brought down, according to official reports, more than fifty German machines, had a thorough knowledge of how long to wait before beginning to shoot at the enemy. The reason so many beginners were killed in the air was because in their excitement they shot all their ammunition while they were too far away from the Germans to have the bullets do effective work, so that when the machines were at about the right range the Germans poured a rain of lead on the defenseless Americans.

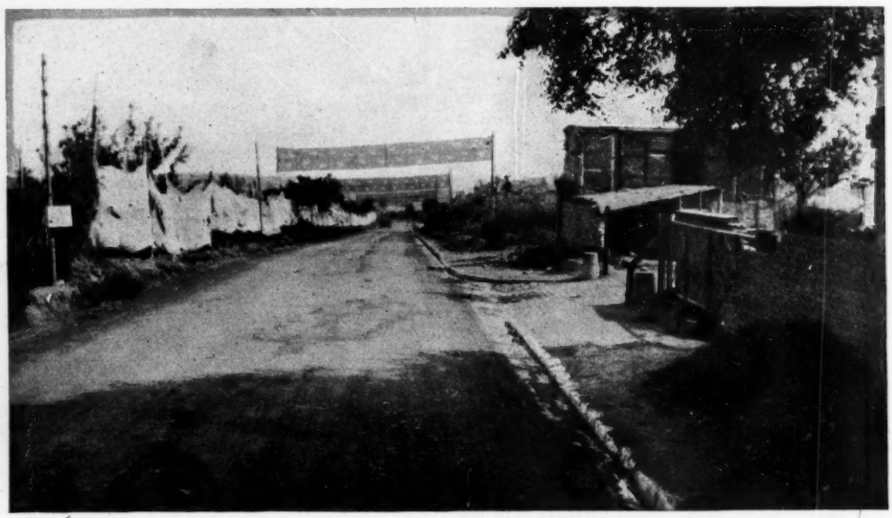
Guynemer had been decorated with practically every medal the French government or army could give, and he was the most probable candidate for the reward of 1,000,000 francs the French government is said to have offered the French aviator who has the most German machines to his credit at the end of the war. The importance of a famous aviator like Guynemer in the army could not be overestimated; whenever rumor had it that "Guynemer is around this part of the country," we lost all our fear of the German airplanes and the bombs they dropped. Whenever a large town was being bombed consistently by the Boches, Guynemer and his escadrille of aviators were sent in the vicinity of the city to protect it, and after a few days the midnight raids of the Germans stopped completely.

On convoys we often drove by the great canvas sheds of the aviation camps. On top of this central tent of the group was always a circular tube of white silk, resembling an enormous stocking, that bellied and fluttered as it swung around in the breeze to point the direction and the velocity of the wind. Sometimes whole sections of airplanes rattled by our camp. Very often the machines on the motor trailers were new airplanes that were going up to the front for the first time, but occasionally the planes were merely a mass of wreckage—broken wood, torn cloth and bent metal that told the story of one more fatal accident.

Where Air Birds Grew

In Paris the same large factory that constructed the wooden bodies for the ambulances built fast "avions of the chase," so I had an opportunity to see the wonderful mechanical birds in the making. The glazed wings, the taut wires, the struts that were glued together of sometimes fifteen separate thicknesses of wood and bored with frequent holes to make them still lighter; the slender, glistening bodies—all spoke of the work of the master that did justice to that of the finest cabinet maker.

A talk with an English inspector of airplanes taught me how the machine guns were connected with the engine so that the bullets fired between the blades of the propeller while the screw was whirling at 1500 r.p.m. The trigger of the gun was connected directly with an eccentric fastened to the shaft of the engine and geared down so that an iron rod went up and down at every four revolutions of the engine. When the aviator pulled a small wire loop inside the cockpit of the airplane, this iron rod pressed the



This shows road is camouflaged to make it invisible to German observers in observation balloons. This would not serve against airplanes

trigger of the gun and shot the bullets between the blades. I learned that the front of an airplane was always its nose, and in the English parlance an airplane was always a "bus." At high altitudes, the man said, the tendency to sleep was always unconquerable, especially if the aviator were reading a book!

"That's a good example of why we don't need stabilizing machines," the Englishman said. "I have a friend who reads a book for 15 min. at a time in the air without touching a lever, and he hasn't got an extraordinary machine at all. Any good one will do that nowadays. It's so darn lonely up there, if you're all alone, you have to do something to amuse yourself.

"Landing is the hardest trick of all in this aviation game, and if you watch your altitude instrument instead of looking over the side of the car as you near the ground, you'll smash your under carriage every time. Another thing you have to watch out for is the possibility of your engine stopping. A fast machine that does perhaps 140 m.p.h. can climb at such an angle that if your engine stops then you don't have time to right yourself—you begin to slide down backward."

Hun Heralded Approach

The hum of the airplane engines was always the first indication of the approach of the enemy avions at the front, for this noise could be distinguished a good minute or two before the white dots became visible in the sky.

"I wonder why the Germans and the French don't muffle their engines so people won't know they're coming?" I asked Ducky one day.

"If you put a muffler on your engine," was Ducky's answer, "you greatly reduce the power and speed of the engine. And at least half of the noise isn't the exhaust of the engine at all; it's the whirr of the propellers which cannot be stopped. And one aviator can't possibly hear an approaching enemy airplane because his own engine makes so much noise."

The buzz of the French engines was like that of a huge bumblebee, pitched at about high G, perfectly steady unless the aviator stopped the engine for a dive. The German engine, particularly the Mercedes, was pitched at about the same note as the French, but it had a distinct beat that varied the steady buzz about twice every second.

It was very easy to distinguish the difference between the two fastest types of French fighting planes. The tail of the Nieuport looked like a rectangle with a nick cut out of the back edge, whereas the tail of the S. P. A. D., or Spad, resembled a half circle with the same nick taken out of the straight edge of the diameter. Most of the French fighting planes were also recognizable from the German by the peculiar staggered construction of their wings. The lower wing was set much farther back than the upper one.

When the Germans came over French territory in a large squadron they flew in a battle formation exactly like a flock of geese heading southward for the winter, a huge V that they maintained perfectly throughout the flight. The French kept close together always, but they never seemed to find it necessary to use such a definite formation to avoid collisions.

In all the towns and farmyards near the front I discovered notices pasted on the walls telling the difference between the German and the Allied airplanes. The two forms of black Maltese crosses, that seemed so typical of the whole system of German warfare, were painted on the under side of the tips of the wings of the Boche planes. The French and British marks of distinction were also on the under side of the wings, but the symbols were in their general shape round instead of square and were concentric circles of red, white and blue. Notices conspicuously placed in the towns instructed the farmers to notify the proper military officials the moment a German aviator landed on their premises and to prevent, if possible, the aviators from burning their machines, for both French and Germans made it a practice of destroying their planes if forced to land in the enemy's country, because they do not want to disclose the mechanical secrets of the machines.

The maneuvers of the avions in the rear and over the actual firing line made a continual passing show. Over Paris I saw aviators learning their profession in practice flights, and on the way from Paris I saw the avions going up from the training camps to the hangars 10 or 15 miles from the front. Once an avion came swooping down, just missing the housetops and trees of the little French town where the section was staying. He was on his way to the front, but engine trouble had forced him to make a quick landing, and he was lucky to have escaped injury when he finally came to earth. The field he picked to land in was muddy and covered with barbed wire fences, and if he had gone a hundred yards farther, his machine would have crashed into the high embankment of a railway.

At the actual front the maneuvers of the avions seemed to be divided almost equally into two parts, observing the military works of the enemy and fighting the enemy planes. Sometimes for a week at a time the continual drizzle of rain kept both French and Boche avions from leaving the ground, but in case of necessity the planes could weather the most violent rain and wind storms. During the beginning of the French offensive in April, the great tractor observation planes came tipping and rocking over the hills from the airdrome at ————, buffeted by the wind and soaked with the rain. The motion of the planes reminded me of a small sailboat, caught in a sudden squall, trying to beat its way back to port. There were the same giddy dips and the same skidding as the planes traveled sideways like a crab. The wings bent and buckled under the unusual strain, but the avion kept pluckily at his job until he slowly passed out of sight over the next range of hills.

Plane Swarms Soar

As soon as the sun peeped out for an instant from behind the scudding clouds, swarms of the great planes left the ground, but they often were wiped out of view as suddenly as they had appeared by a blue-gray cloud of mist. Occasionally the wind got under one wing of a plane as the aviator was trying to make a turn against the miniature hurricane, and all the bystanders held their breaths for fear the machine would turn completely over, for the wings tilted until they were almost at right angles with the ground, but with a breathless swoop the aviator righted his plane in the nick of time.

As a rule the French planes flew much lower than the Germans, even when they were almost over the first lines. The Boches that came within range of the French aircraft guns were usually so high they seemed like tiny dots in the sky, but very near the front the Germans sometimes swooped within a hundred yards from the treetops. The favorite times for flight chosen by the Frenchmen were from daybreak until 7 or 8 in the morning and just as the sun was going down. In the middle of the day the Boches reigned supreme. They came over far back of the lines with only an occasional shrapnel puff to worry them.

(Concluded next week)

A 90-hp. French truck used for hauling stone. It can be either a wheel drive or creeper drive type. As a creeper the endless chain encircles the rear wheel and serves as an anti-skid attachment

U. S. Motorcycle for War

Engine to Be Fitted on All Purchased by Quartermaster Department About Ready to Serve

TO the war motor kit the United States now has added the standardized motorcycle. The engine to be fitted on all motorcycles purchased by the Quartermaster Department hereafter is about complete. The U. S. A. machine is to be used for many duties at and behind the front. Probably 90 per cent will be fitted with sidecars, and for this reason, as well as the heavy roads to be traveled, the engine is to have slightly lower compression. This will mean a somewhat depressed power curve at the upper end, but the engine can run on full throttle at lower speed, that is, the machine can hang on with great tenacity in pulling through sand and mud or under other difficult conditions.

In a series of tests the engine developed a maximum of 15.3 hp. at 2900 r.p.m. This corresponds to a piston speed of 1750 ft. a minute and a mean brake effective pressure of 65.6 per square inch. Whether the equipment used during this test will be the regular equipment is undecided.

There is nothing radically new in the design of the engine, which may be said to embody the best modern practice in motorcycle engines. Where deviations from stock practice have been made the reason has been either that the special purpose for which the machine is designed could be better met by a different design, or, since no commercial questions need be considered, and the best is just good enough for Uncle Sam's boys at the front, materials are used which would not be considered in stock practice because the average purchaser would not appreciate their value.

Is Two-Cylinder

The U. S. A. cycle engine is of the four-cycle, two-cylinder, V type, air-cooled. It has a bore of 3 5/16 in. and a stroke of 3½ in., giving a piston displacement of 60.34 cu. in. The cylinders are at an angle of 45 deg. The compression space is 11 cu. in.

Cooling flanges on the cylinders run circumferentially, while those on the head run fore and aft. On the crankcase castings are formed a bracket for the ignition magneto and a saddle for the lighting generator, the two being located on opposite sides.

A so-called keystone type of frame is to be used. Instead of the frame tubing looping around the crankcase at the bottom and carrying brackets to which the engine is secured, the engine crankcase forms the keystone of the frame structure. This places considerable strains on the crankcase in going over rough roads, and to allow for these some rather heavy lugs are cast on the lower part of the crankcase, and the crankcase wall between these lugs is thickened.

All bearings on the crankshaft, with the exception of that at the cam gear end, are roller bearings. One of the connecting rods has its head made in the form of a yoke, and the other is of the ordinary type. Both have solid heads, which is rendered possible by the fact that the crankshaft is built up and the connecting rod heads can be slipped over the crankpin before the latter is assembled with the flywheels.

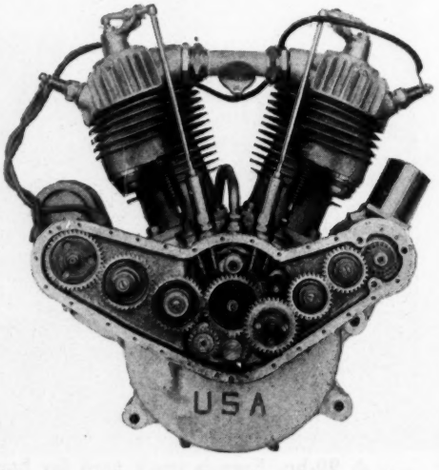
The two inclosed flywheels will be made from drop forgings instead of from iron castings. Although the bursting of flywheels is an almost unknown occurrence in the motorcycle industry, it was considered good practice to make this impossible in the Army machine.

Cast-iron pistons are used, with three rings at the upper end and an oil groove at the lower end. A substantial rib connects the piston bosses to the head and helps in the transfer of heat from the head to the skirt. The wrist pin is secured in one of the piston bosses by a 1/16-in. solid pin with a cotter end. The connecting rods are drop forgings of I section and are made as light as their work will permit.

An interesting feature of the engine is the all-spur gear drive for the camshaft, the magneto and the lighting generator. With it is combined also the worm drive for the oil pump and the drive for the crankcase release valve. There are eleven spur gears in this double train, but each is of liberal dimensions for the amount of power to be transmitted, is carried on a well-supported shaft or a hardened stud supported at both ends, and provision is made for thorough lubrication, so the likelihood of trouble is very slight.

Though the magneto runs only at half crankshaft speed, the generator runs at twice crankshaft speed, this high speed resulting in a very light and compact machine. As current for lighting is used only at night and the generator serves no other purpose than to furnish this current, provision is made for disconnecting the generator during the day.

Referring to the protograph of the engine herewith, showing the gearcase cover removed, the crankshaft pinion meshes with the camshaft gear directly above it. This latter meshes with a pinion to the right of it, which is hidden in the illustration by the gear in front of it. This set of gears on the same axis can be coupled together and disengaged from each other by a jaw clutch whose members are formed on the gears themselves and which is operated by a knobbed rod extending through the cover plate.



U. S. A. motorcycle engine with gearcase cover removed

In the photograph showing the gear cover removed from the engine may be seen the method for insuring an accurate mesh of the generator gear with its driving gear. The forward end plate of the generator is turned with a shoulder 1⅝ in. in diameter and 1/16 in. long, which enters a bore in the gear housing in which it fits snugly. The generator is then drawn up tight against the housing by three ¼ in.—28 screws which extend through both the housing and cover plate, so it is not necessary to take off the gear cover plate to remove the generator. Provision also has been made to prevent oil from the gear compartment getting into the generator. To this end a knife edge is turned on the hub of the generator gear, which throws off any oil passing along the gear hub toward the generator.

Lubrication

As the two pistons connect to the same crankpin and move up and down in their respective cylinders at the same time, there is considerable pumping action in the crankcase, and to prevent oil being forced out through the vent the latter is opened and closed by a rotary valve at the proper periods in the revolution of the crankshaft. The timing of the valve is such that it is closed whenever the crankcase volume decreases. Thus there is at all times a partial vacuum in the crank chamber and there is no tendency for the oil to be forced out through the bearings and joints.

The inlet valves are located in cages over the exhaust valves and are opened by tappet levers and rods from cams on the same camshaft as the exhaust cams. The main springs of the inlet valves are inside the cages but there are supplementary springs on the tappet rods which cause these rods to maintain contact with the rock levers and the latter with the cams.

All the valve springs are inclosed and, in addition, a pressed steel housing in two parts has been worked out for the inlet valve cages and tappet levers. These housings are held in place by the bolts on which the tappet levers are mounted. The housing fits snugly around the bell-shaped inlet valve cage and is clamped under the head and nut of the tappet lever bolt. The bolt is drilled out for wick oiling and has a reservoir with clip cover in its head which comes outside the housing, so the latter does not interfere with lubrication;

in fact, the whole inlet valve assembly can be removed without first taking off the cover.

Instead of the flanged joints for inlet and exhaust manifolds which are universal in motor car and truck practice, flared tube and gland type joints are used for the exhaust and inlet pipes. The exhaust outlet on both cylinders extends downward, as this is the direction the exhaust pipes must take and hence the number of right-angle turns in the exhaust passage is kept down to a minimum.

Lubrication is effected by a plunger pump which is built into the gear cover plate and driven by a worm and worm wheel from the magneto drive gear. A rotary valve is used for the oil pump, which is in one piece with the worm gear of the drive and it can hardly be doubted that this type of valve is more dependable than the more common ball check valve type.

The oil is taken by the pump from the supply tank combined with the fuel tank and fed into the crankcase. As the oil is fed to the crankcase continuously there is always a certain amount in the case which is picked up by the revolving flywheels and distributed over all interior parts. A hand pump also is to be carried on the motorcycle, to permit of delivering additional oil to the crankcase in climbing long grades or when the engine is working under other difficult conditions.

At the present time practically all motorcycles are fitted with a certain make of carbureter which seems to fit the conditions of motorcycle work particularly well, and the probability is that this carbureter will also be used on the U. S. A. motorcycle. It is of the type in which the needle valve in the spray nozzle is lifted by a cam mechanism actuated by the throttle valve.

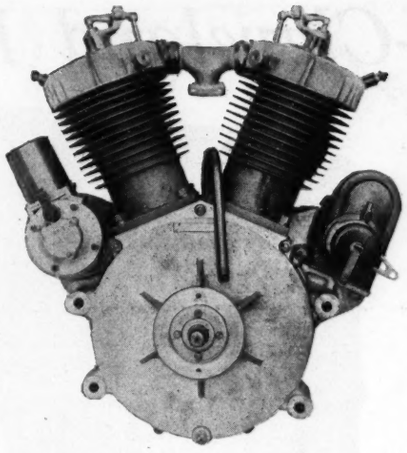
Air Cleaner

It is now planned to use an air cleaner or strainer on the carbureter air inlet so as to keep dust and gritty matter out of the cylinders. This is particularly desirable on a motorcycle because it may happen that a rider on striking a sandy stretch of road may fall, the air inlet coming down to the sand and the motor continuing to run way down in the sand which will ruin it in short order. Aside from this eventuality, the roads and tracks over which military motorcycles are compelled to travel, often in squadron formation, are apt to be very dusty in summer time and the fitting of an air cleaner would seem to be an excellent idea, if it does not materially reduce the engine power.

The make of carbureter referred to has had two separate air inlets, but in order that all of the air may be strained by a single cleaner the maker has brought out a special model in which the two air inlets are combined into one. From this inlet connection is to be made to the air cleaner by means of a flexible tube.

Several changes have been made in the carbureter to add to its efficiency. Thus a low-speed adjustment has been provided by making the cam in the form of a bronze spring with screw adjustment.

Experiments are being conducted with three different designs of inlet manifolds, with different carbureters, carbureter air valves and dust separators. It is the intention to use a dust separator if one can be found which does not decrease the power too much. The attachment of an air cleaner to the carbureter alters the suction curve and as the carbureter is of the type in which the gasoline flow is regulated by a needle lifted by the throttle through the intermediary of a cam it is likely that the cam outline will have to be changed. In a preliminary test run with one of the air cleaners the setting of the carbureter had to be changed with almost every increase in speed to get the best power results.



Two-cylinder, V-type, air-cooled engine for U. S. A. motorcycles

The final selection of equipment will be made not entirely on the basis of maximum power developed but also in accordance with the pulling power and smoothness of operation of the engine at low speed, easy starting and other characteristics.

The engine design for the U. S. A. military motorcycle is the work of the Motorcycle Division, Engineering Department, Quartermaster Corps, which occupies offices in the Union Station, Washington, D. C. This was formerly the Military Motorcycle Standardization Board, its members being William S. Harley of Milwaukee, Wis., Oscar Hedstrom of Springfield, Mass., and Frank Schwinn of Chicago, with Capt. F. C. Hecox, representing the Army. Charles Franklin has been in attendance and A. W. Herrington also has been taking part in the work, having charge of all tests.

MISSOURI ROAD MEN MEET

Kansas City, Mo., March 15—That many factors are working together to bring about more efficient and more extensive road work in Missouri this year was brought out at the eleventh annual meeting of the Highway Engineers' Association of Missouri here. Perhaps the most important factor is the prime necessity of getting the roads in shape to carry the motor traffic necessary to move farm crops. One of the most striking illustrations of this need is in Atchison county, one of the best corn counties of the state. One farmer, 10 miles from town on a dirt road, has forty cribs of corn, each crib 16 ft. long, 12 to 14 ft. wide and 10 to 12 ft. high, 900 bu. to the length, or more than 36,000 bu. He is hauling his corn to a shipping point 10 miles over a dirt road up and down hill by truck, 150 bu. to the load, making four trips a day. With teams, he could haul 50 bu. to the load and might squeeze in two trips a day. It is absolutely necessary that he haul by truck, therefore, because of the shortage of men to drive teams and the importance of getting the corn to the shipping point to be ready when cars happen to be there but—the culverts and bridges are breaking down under this rapid traffic of the heavy trucks. Tractors run over these bridges every year but the tractor operators, going slow, stop and lay down planks. No planks are laid for trucks.

CROSS-COUNTRY MARKS

Detroit, March 15—Under the direction of Ray McNamara, road engineer, Maxwell trucks loaded with touring cars recently made a trip from Detroit to Washington over ice and snowbound road in 48 hr. 50 min., including stops along the way for lunch.

Leaving Detroit the Maxwells rolled into Toledo in 4 hr. Cleveland, 126 miles from Toledo, was reached in 9 hr. Fast time was made to Youngstown, and the 153-mile run to Pittsburgh rolled up a mark of 11 hr. 5 min. Chains were necessary across the Alleghany mountains, but the up-grade of 108 miles was made in 10 hr. 35 min. The last day was the most severe of the trip. Sidling, Ray and Scrub mountains were crossed and after 26 miles of climbing McConnellsburg was reached in 3 hr. 30 min. The distance from Everett, Pa., to Washington, 168 miles, was covered in 14 hr. 10 min.

TO BRING OUT NEW ENGINE

Detroit, March 15—The Golden, Belknap & Swartz Co. is working on a new engine of a heavy-duty type for trucks and tractors. It is expected that the model will be ready within two weeks. The cylinders will be cast singly and will have overhead valves. The engine will have the forced-feed oil system. The retail price will be approximately $300. The company expects to produce 5000 of the old model during the balance of the year.

MAY STANDARDIZE TURNBUCKLES

Dayton, Ohio, March 15—Members of the Society of Automotive Engineers met here recently to discuss the proposed standardization of the turnbuckles, manufacturers having made an appeal for assistance in this regard. M. W. Hanks, representing the society, presided at the session, which considered the problem in all of its aspects. It was regarded as important to the interests of the nation at this time that careful, yet prompt, action be taken in meeting the requests of airplane manufacturers in the adoption of a uniform standard for turnbuckles, with a view to speeding up airplane production in the United States.

1500 GILLETT TIRES DAILY

Eau Claire, Wis., March 15—The Gillett Rubber Co., Eau Claire, Wis., is increasing its output from 500 tires to 1500 tires a day, following the installation of a new calendar machine. Before the close of summer it is hoped to bring the capacity up to 2000 tires a day.

Akron-Cleveland Expresses

A 40-Mile Service That Works

PRACTICALLY none of the 50,000 tires produced daily at Akron, Ohio, is shipped out by rail. Instead the tires are shipped direct to Cleveland, 40 miles away, by motor truck. The railroads even have found it much quicker and less expensive to route their express matter from the main lines into Cleveland and then haul it to Akron by motor trucks. Practically all the tires manufactured by Goodyear, Goodrich, Firestone, Miller, Swinehart, Mohawk, Kelly-Springfield and other tire companies at Akron are handled in this way.

Most of this express haulage is from Cleveland to Akron and is handled by several motor truck contractors. Perhaps the largest of those handling express matter is the Knutsen Motor Trucking Co., Cleveland, which has the contract for moving all the American Express Co.'s business between the two cities. This work is done on a contract basis at the rate of 40 cents for 100 lb., either way between the two cities, and includes the pickup charges.

The trucks haul this matter at less cost than by rail. The railroad rate from terminal to terminal is 27 cents for 100 lb., with 10 cents additional for pickup charges at both ends, making the total rate 47 cents for 100 lb. The motor trucks average about 4 hr. for the run between the two cities, whereas by rail it takes at least one day under average normal conditions, if the goods are delivered in time to catch the train running between the two cities, or even two or three days if they have to be held over night in the freight yards.

The trucks from Akron to Cleveland average 4 hr. for the trip

Since the great bulk of the express matter passes one way from Cleveland to Akron, the trucks are available for other material for return loads to Cleveland and the various tire concerns and other rubber goods manufacturers were quick to take advantage of the service thus made available.

The use of motor trucks in this work is increasing rapidly and the reason may be explained by citing one example. Goodyear recently was unable to ship even one car of its goods from its factory by rail for three days. As a result Goodyear is considering seriously putting on a large fleet of thirty or more trucks for the delivery of its entire output to its branches that are situated east of the Mississippi river.

Heavy on Roads

The demand for an increased truck service between Akron and Cleveland placed a great burden on the one existent main-line road between the two cities. This road was a 14-ft. highway with a 4-in. concrete base and a brick top. The first section was built in 1912 and the last in 1915. It was never intended as a motor truck road and as a result did not stand up under the tremendous increase in the number of trucks using it in this service during 1917.

In the first place it was far too narrow,

A Packard in one of the drifts cut through early in February

A line of trucks is held up on the Cleveland-Akron

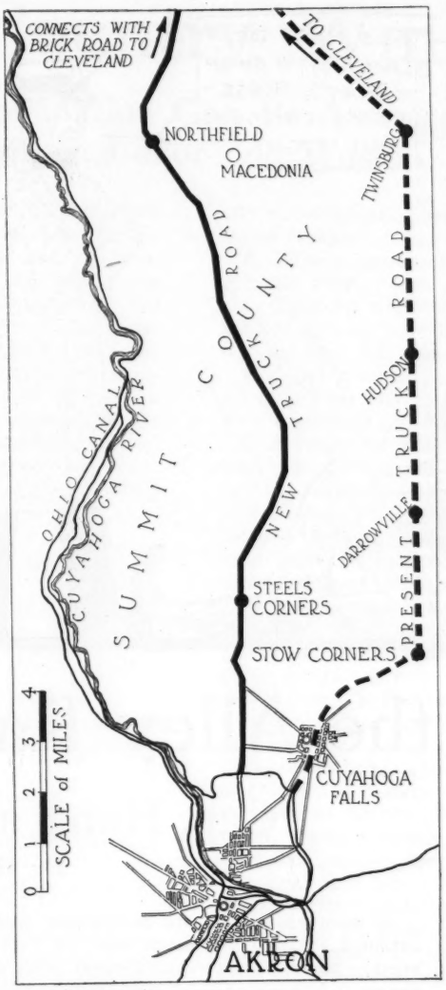
the 14-ft width making it necessary for a large 5-ton truck to run off the edge of the road when passing another vehicle running in the same or opposite direction. As the soil was soft along both sides of the route, many of the trucks became mired in turning out for other vehicles. This caused such inconvenience and loss of time for truck owners that they finally prevailed upon the county commissioners of Summit County to lay a 4-ft. strip of slag on one side of the road to eliminate this difficulty. Even with this work done, the road has gone to pieces much more quickly than expected, although it is now admitted that a road with only a 4-in. concrete base is not sufficiently strong for continuous traffic of heavily-loaded 5-ton trucks.

Estimate of Traffic

To estimate the traffic passing over the Akron-Cleveland road, a survey of 72 hr. was made from May 19 to May 21, 1917, inclusive. It showed that a total of 507 motor trucks, 9106 passenger cars and 191 horse wagons passed the point of observation during the time of the survey. The total of all vehicles passing in both directions on the dates mentioned was 9804 and the maximum concentration occurred between 4 p. m. and 5 p. m. on Sunday, May 20, when 655 vehicles of all kinds passed the station of the observers.

The motor trucks were being operated very inefficiently in all cases, and especially on the 1½- and over 5-ton sizes where the number of trucks counted empty exceeded those with loads. These conditions since have been improved by obtaining return loads, so that the great proportion of the trucks running between the two cities now have full or nearly full loads in both directions.

If the maximum concentration of 655 vehicles of all kinds had been trucks, each with a 3-ton load, 1965 tons would have passed over any point of the route each hour. If this rate were continued for 24 hr., the tonnage handled would have amounted to 47,160 tons, or the equivalent of 1179 loaded 40-ton freight cars. The actual tonnage of commodities moved during the hour mentioned was 890 tons, equivalent to twenty-two 40-ton freight cars. It thus is seen that the capacity of the road was not reached, since the twenty-two freight car loads actually noted is less than 2 per cent of the possible 1179 freight car loads that could have been carried by the trucks.



The old and new truck routes between Akron and Cleveland

Last winter, which has been the most severe winter experienced since motor trucks have been used in any great number, placed an additional burden on the one main highway. At first the deep snows prevented all traffic between the two cities and it was necessary for the trucking concerns themselves to send out crews of men to cut through the drifts to let the trucks through. In this work the Knutsen company pioneered the work, at one time having at least thirty men working on the road so that its fleet of trucks could get through uninterrupted. Jan. 25, 1918, the Summit County commissioners and the township trustees, through which the road passes in Summit County, appropriated $2,500 for keeping the roads clear of snow. Although several of the severe storms got the better of the organization with the snow removal work in hand, the road has been open with but few exceptions since.

New Bond Issue

The great service which the trucks running between Akron and Cleveland have performed has waked up the Government, the state, the counties and the townships to the necessity of a real motor truck road between the two points. As a result the Summit County highway commissioners have decided to raise a bond issue of $600,000 for the construction this spring of a new and real motor truck road in Summit County and connecting up with the present route to Cleveland at the Cuyahoga County line, in which Cleveland is situated.

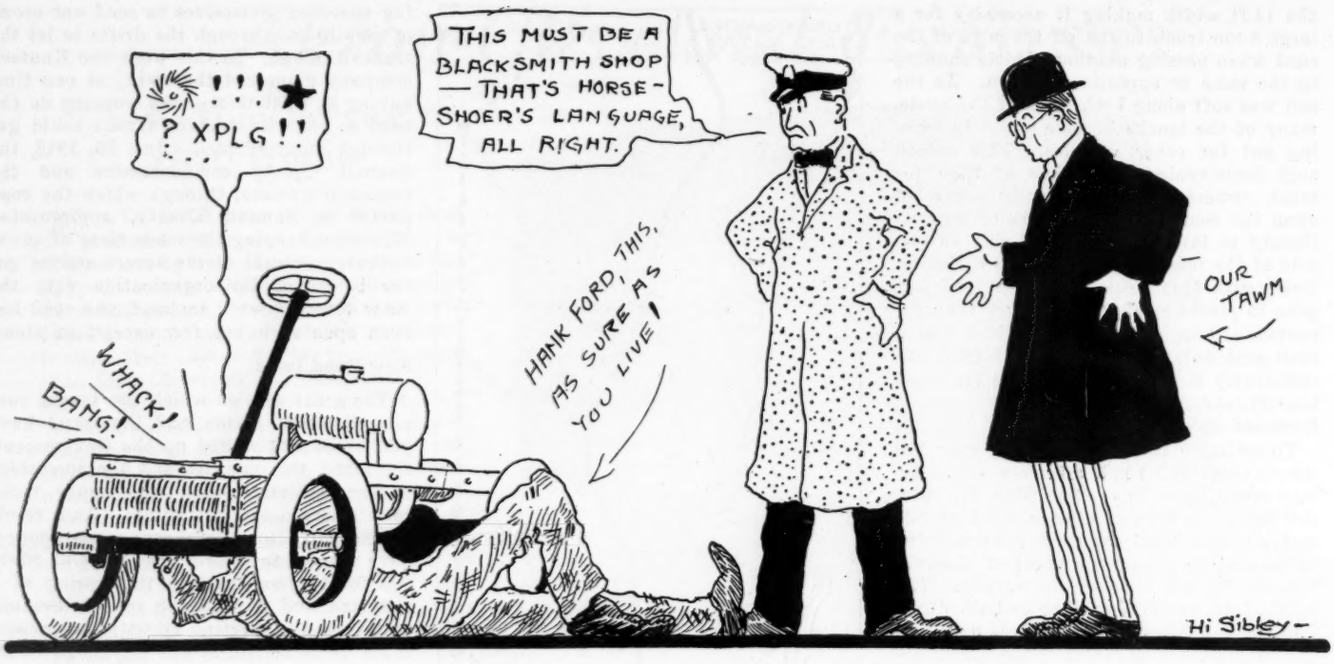
The new road will have an 8-in. concrete base with a brick top 18 ft. wide with 8-in. concrete curbs flush with the brick on either side, giving a total extreme width of 19 ft. 4 in. The new road will be about 2 miles less in length than the present road and will have shorter grades, although the maximum gradient in each case is 7 per cent, except for a stretch over a river gorge where it mounts to 8.25 per cent.

The new road will serve a dual purpose in that its greater portion is now used for parcel post vehicles. While the old road runs between Stow Corners, Darrowville, Hudson and Twinsburg to the Cuyahoga County line, the new road will follow a

(*Concluded on page 35*)

road and waits for road gangs to open the passage

Another good view of the drifts that had to be broken to keep going



Tales of the Alley Rats—No. 5

Cap, Hank and Ford No. 3

By Hi Sibley

This is the fifth of a series of articles based on the stories told by Captain Manlove A. Shuey, or Cap, as he is more often known, a pioneer dealer whose tales are of the early days, when a dealer's life was very extraordinary indeed. Cap claims to have sold the third car Henry Ford ever built. Others say it was the thirty-third, but at any rate it is true that Cap was one of the very first Ford dealers. The last of the series, "The Petulant Pioneers," will be published soon.

A JULY rain came down in torrents. Pedestrians sloshed hurriedly over the glistening sidewalks, heads bent to the storm. Now and then one of them ducked into the alley at Pommert & Jay's barber shop and, picking his way around the puddles in the uneven pavement, disappeared through the double doors of a dingy little brick structure a stone's throw from the street.

Externally this alley rendezvous was anything but inviting, but had you once spent an afternoon within its walls you would understand the charm, for this was the Alley Rats' Nest, made famous by its versatile proprietor and host, Cap Shuey, erstwhile circus-acrobat, steamboat captain, motor car dealer and raconteur of the first water. Here men of all conditions were wont to foregather of an afternoon to enjoy the reminiscences disseminated by this diverting character.

The inclement weather had brought a full attendance of Alley Rats, as the habitues of the place were known. School boys, bank clerks, teamsters, lawyers, merchants and Civil War veterans filled the assorted chairs and closely packed motor cars to overflowing, and every mother's son of them had his ears tilted forward to catch any gem of philosophy or shaft of repartee Cap might drop.

As soon as this astute entertainer was satisfied that all his guests were in a receptive mood, he refreshed himself with a generous helping of Fast Mail, with which he prefaced all his anecdotes, and waited for his cue. Presently it came with the casual mention of Henry Ford and politics.

"Good old Hank," Cap began, "he certainly has spread out some since I first knowed him, boys; yessir, he sure has growed a lot in the last fifteen years. Why, it seems like only yesterday that he was puttering around in overalls."

"Did you really know him then, Cap," interrupted a skeptical younger member of the group.

"Know him? KNOW him?" Cap repeated with hauteur. "Why, me and Hank was just like that," exhibiting a pair of crossed fingers.

"Tell us all about it, Cap!" urged the Alley Rats in eager chorus.

"Well, it happened some time ago, but every word I'm tellin' you is true just as sure as I'm standin' here. If Tom Slick was here he'd tell you the same.

A Tractable Wagon

"You see, after I'd peddled quite a few of them Mobile steamers the owners began to make pretty regular trips to the hospitals for a general and necessary overhaulin', so I realized that if I was going to stay in the game I'd better get some more tractable kind of wagon to market. About that time the gas cars were coming in, and one day a rubber man told me of a new machine that was being made up in Dee-troit.

"'A chap by the name of Ford is buildin' em,' says the rubber man, 'hasn't got any capital and used to be a plumber or something. He's only built one or two but they look like a practical horseless carriage, and if you get the agency you might be makin' money some day.'

"I'd never heard of Ford and didn't know anything about a gas car, but about this time Tom Slick begun to git the fever and since he seemed to be leery of the steam wagons, I suggested we go to Dee-troit and look up this Ford feller. 'You're on,' says Tom, and we went up.

"Had an awful time locatin' him. They were plenty of Fords in the directory, but nobody seemed to know anything about this particular Ford. Finally we found his place, way out at the end of a car line—I fergit the street. It was an old blacksmith shop, and outside of moving out the horseshoes and paintin' 'H. Ford, Automobiles' on the door they wasn't any remodelin' to speak of.

"Me and Tom stepped inside. In the middle of the floor was a half-built machine—a complicated looking' contraption to us, and they was a pair of legs stickin' out from under it. As I recollect they was a good many grunts and considerable fancy language coming out from under it, too.

"Nobody else was in the shop, but bimebly the feller got through cussin' the machine and crawled out. He was a lean, mild-mannered, serious-lookin' young chap, that is, as serious as a fellow can look with his face smeared with grease and a gash over his eye.

"'What can I do for you, sir?' he asks, polite.

Help the Country Win the War

How Distribution Can Be Arranged to Lessen Labor and Waste

TO win this war we must do things. Do them quickly, with less labor and less waste. We must increase valuable activity and decrease wasteful activity. We are at present suffering from a decrease of activity all along the line. This decrease comes from the inadequacy of the distribution system. It is time for the producer of raw material, the manufacturer, the warehouseman, the jobber and the dealer to understand that distribution, the movement of materials from the point of production to the point of fabrication and the movement of goods from the point of fabrication to the point of consumption is the foundation of all industrial endeavor.

It is recommended for this reason that, generally speaking, the shipper should be urged to foster movements in the following directions:

Improvement of Railroad Service

1. The provision of adequate rules to secure the full efficiency of transportation service.
2. This includes establishing proper charges for freight and demurrage and the enforcement of equitable rules for loading and unloading, shipping and packing.

For the Highways

1. The extension of paved highways.
2. Provision for keeping these highways open at all seasons.
3. Proper provision for the maintenance of these highways.

For the Waterways

1. The construction of barges and small tow boats to provide for the adequate use of existing highways.
2. Provision for putting into shape existing waterways that have been allowed to become obsolete.
3. Provision for the wise extension of these waterways to correlate with the railroad system.

As a measure of relief from the present congestion, it is recommended that the shipper be advised that he can materially aid himself in the improvement of his own transportation conditions and the elimination of the excessive costs of not being able to do business, by carrying out the following suggestions:

With the Railroads

1. Co-operate and put it over. Do not kick at changes.
2. Load and unload promptly. Do not wait for a convenient season.
3. Load to capacity.
4. Do not reconsign en route. Decide the destination before the goods leave.
5. Pack securely and mark plainly.

With the Highways

1. Make a survey of all the incoming and outgoing freight handled within zones of 10, 25, 50 or 75 miles from your city.
2. Ship all goods to be delivered within the above zones over the road by motor trucks.
3. Demand that all goods to be shipped to merchants in your city and originating within the zones mentioned be delivered by motor trucks.
4. Make a census of all motor trucks in your town available for this work.
5. Take up with your local offices of the national express companies and your local haulage and express concerns as to how far they can extend their present delivery routes.
6. Select a committee of the best traffic managers of the concerns in your city to lay out a detailed plan to suit your own local conditions and determine upon the fair rates to be charged.
7. Arrange for a sufficient number of receiving platforms or warehouses where you can use horse-wagons and motor trucks up to 3-ton capacity to deliver and set-down goods, leaving for the larger trucks the running between the main points in the zones. Do not try to make the trucks running overland between the main points do pick-ups and deliveries. It cuts down their efficiency and makes the maintenance of schedules impossible.
8. Put some trucks in the overland haul work on definite leaving schedules so that goods can be delivered to the receiving platforms or warehouses in time to make up full loads to any given points.
9. Arrange a Return Loads Bureau. Arrange with the local telephone companies to give your regular telephone number to any inquirer calling up and asking for Return Loads Bureau. Post notices in the offices of all of your merchants that you have established a Return Loads Bureau. Post similar notices in conspicuous places in the smaller towns and cities through which trucks running to or from your city will have to pass. This will enable your trucks and those of private truck contractors doing this kind of haulage and entering your city to quickly collect loads to be transported to their home cities.
10. Bring all pressure to bear upon your mayor and the governor and thence to your highway commissioners to keep all the main highways leading out of your city open during the remaining winter months.
11. Bring all pressure to bear on the proper authorities toward the resumption of the construction of main line highways at the earliest possible moment this spring and for a proper maintenance of the roads all year around.

With Waterways

1. Secure information upon transportation available on existing waterways covering short hauls.
2. Get behind the movement for immediate production of barges for the large canals, such as the Erie barge canal, which would relieve the freight situation between the lakes, coal regions and the important centers on the Atlantic seaboard.
3. Take up with the traffic manager of your business and the traffic expert of the local chamber of commerce the possibility of the use of waterways for any part of your freight movement and arrange shipping plans accordingly.

"Me and this here gentleman is lookin' for a Mister Henry Ford, says I.

"'I'm him,' says he, quiet like, and at your service.

"So I explained that we wanted to have a look at his gasoline automobile, and have a demonstration, if possible, and he seemed to be mighty tickled to have prospects come 300 miles just to see his car. He wanted to know how we happened to hear of him, and I told him about the rubber man.

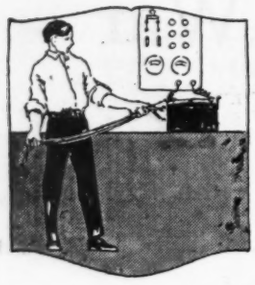
"'Wait a minute till I put in a couple of bolts and stick on a seat and I'll show you how this automobile handles,' he says, which we did, and then he took us out along the boulevards and through the parks. That model had a two-cylinder ten-horse engine, and the first wheel steer I'd seen, and it seemed like there was no limit to her power. I was sittin' on Tom's lap on a soap box and when Hank opened her up I thought we sure was ridin' right into eternity, though I don't s'pose we was going over 30 miles at any time.

"Well, Tom was so pleased that he wanted that car right away, but we had to wait around a couple of days before it was finished. It's a fact, boys, that we had to advance Ford $30 so's he could get paint and screws and things to finish her up with. If Tom was here now he'd tell you the same.

"And that was the third car Henry Ford ever built. Since then I've sold hundreds of 'em, and they always come back for more. Made a lot of trips up to Dee-troit after that, and me and Hank got to be right chummy. Why, lots of times he'd come down here just to visit and talk over old times, and never mention a word about business.

"How'd you happen to be selling T-A-D's now instead of Fords, Cap?" inquired a Rat on the inner circle.

But the arrival of a prospect at this juncture relieved Cap of the necessity of explaining his defection, and he promptly put aside Ford and the past in his endeavors to impress the newcomer with the fine points of the T-A-D.



Electrical Equipment of the Motor Car

By David Penn Moreton & Darwin S. Hatch.

Editor's Note—Herewith is presented the eighty-seventh installment of a weekly series of articles begun in MOTOR AGE, *issue of June 29, 1916, designed to give the motorist the knowledge necessary to enable him to care for and repair any and all of the electrical features of his car, no matter what make or model it may be. At the conclusion of this series, "Electrical Equipment of the Motor Car," with additions, will be published in book form by the U. P. C. Book Co., Inc., New York, in a size to fit the pocket conveniently.*

A thorough explanation of the fundamentals of electric circuits preceded descriptions of the general types of starting, lighting and ignition apparatus, signalling devices, magnetic transmissions, etc. This is being followed by the installation, care and repair of individual systems, beginning with the special equipment for Fords.

Part LXXXVII—Westinghouse System for Ford Cars Concluded

IF the lamps in one circuit do not burn, the trouble may be due to the lamp being burnt out or a broken connection in the wiring. Carefully examine all the places where the electrical connections are made on that particular circuit, and try a lamp that you know is O. K. in the lamp socket.

If none of the lamps will burn, and the voltmeter reading, when the instrument is installed as instructed in the section on installation of voltmeter and ammeter, drops to zero with the engine stopped, this may be due to:

(a) The terminals of the battery are disconnected or corroded so that they do not make good electrical contact.

(b) The wire W, Fig. 472, is disconnected or broken. If the voltmeter indication is O. K. the trouble may be due to:

(c) Blown fuse. If the fuse is blown do not replace it immediately but look over the wiring carefully for an accidental ground or short-circuit. In looking for grounds or abrasion of the insulation on the wire or an electrical contact between the ends of the cables or current-carrying parts of the wiring devices and the metal of the car, socket shells, etc., should be looked for. When the trouble has been located and corrected, replace the blown fuse with another fuse of the same current capacity. If the trouble on the circuit cannot be located immediately, then turn off the switch on the damaged circuit or disconnect the part of the circuit in trouble by loosening a wire from under a screw or disconnecting it, if absolutely necessary, by cutting the wire, and have the difficulty adjusted at the very first opportunity. If the trouble is in a particular lamp socket, disconnect the attachment plug from this socket until the trouble can be removed, and see that the removed attachment plug does not dangle in such a way as to make short-circuits on the metal of the car.

(d) Wire W or W-1 may be disconnected or broken. If this is the case the starting motor will not operate.

(e) Wire W-4 or W-5 may be disconnected or broken.

(f) The lamps may be burnt out. This is likely to be the case when any of the troubles a, b or d of this section happen.

(g) The battery may be run down.

If the lamps in a circuit go out for an instant only, the trouble is probably due to a loose connection in the circuit so affected. If all the lamps go out for an instant, there is probably a loose connection at one end of thewire W-4 or W-5.

If the lamps are dim when the engine is not running, this indicates that the battery is discharged. If possible, have the battery charged at once from an outside source. It is advisable to check up on the charging rate to see that the battery is being properly charged.

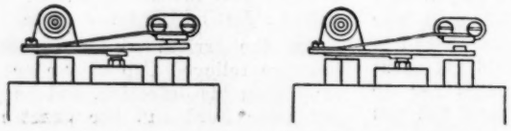


Fig. 485—Opened and closed positions of Westinghouse cut-out switch

Battery Troubles

The battery may not stay charged and the difficulty may be due to any of the following causes.

(a) The car is not run enough without the lights or at high enough speed for the generator to charge the battery and replace the electrical energy that is drawn from the battery when the lamps are burning with the engine not running or running at very low speed and that used in operating the starting motor and ignition unit.

(b) A ground in the car wiring. With the engine stopped and the lights turned off, disconnect one of the battery wires and touch it lightly on the battery terminal a few times. If a spark is produced there is a ground or short-circuit in the wiring.

The battery may not charge even though the engine is running at a high enough speed, due to one or more of the following causes:

(a) Loose connection between the starting switch and electrical unit. See that the terminals of the wire W-2 are tight, and examine the wire between the terminals for a break.

(b) The magnetic switch, or cut-out, in the generator circuit is not operating properly. Examine the switch and see that it is connecting and disconnecting the generator and battery properly. The switch should be in the open position when the engine is not running, as shown to the left in Fig. 485, or should stay in the closed position, as shown to the right in the figure, when the engine is running at a speed equivalent to a car speed of approximately 9 miles per hour with high-gear connection. This speed at which the cut-out closes, of course, varies considerably. If the switch does not close, the generator is not developing sufficient voltage due to the presence of oil on the brushes or commutator, or some of the brushes may be worn to such an extent that they do not make electrical contact with commutator.

(c) The friction sprocket may have lost its tension. With the engine stationary, try to turn the electrical unit by hand in both directions. If it can be turned easily in one direction the nut, Fig. 463, should be tightened sufficiently to enable the engine to drive the electric unit. When running the car at 15 to 20 miles per hour a faint click may be heard about every 5 minutes. If the clicking becomes more rapid than three or four times in 5 minutes, tighten the adjusting nut a third to a half turn.

(d) The shunt-field brush, Figs. 472 and 473, may not make good

contact with the commutator. Adjust this brush and if this does not correct the trouble make the following tests: Test out the shunt-field circuit for open connections. If the shunt-field winding is found open-circuited, the trouble was no doubt originally due to an open circuit between the generator and the battery or to running the generator with the battery disconnected.

(e) If the engine turns over slowly after the ignition switch is turned to the "off" position, it is an indication that the generator cut-out is sticking and the battery is discharging through the electrical unit which is now operating as a motor. Should this happen, immediately close the ignition switch and while the engine is running disconnect the wire from the generator and then examine and adjust the cut-out switch.

Ignition Troubles

If the engine fails to pick up the difficulty may be due to failure of the spark, and the following inspections and tests may be made:

(a) See that the ignition switch is in the "on" position and that the wire or wires leading from the switch to the ignition unit are not disconnected or broken.

(b) See that there is gasoline in the carbureter and if there is none it may all be used up, it may not be turned on, or the gasoline feed pipe or valve may be stopped up. If the system is of the gravity feed type the gasoline may not flow into the carbureter on steep hills.

(c) If there is gasoline in the carbureter, take out one of the spark plugs and lay it on the engine with the sparking points in the air but with the threaded part in contact with the engine frame. Turn the engine over by hand or the starting motor, and if there is a spark produced at the plug gap, the trouble is not in the electric system but probably due to poor gasoline, water in the gasoline or the temperature may be too low for the grade of gasoline used.

(d) If the same battery is used for the starting motor and ignition and there is very little charge in the battery, the battery may not be strong enough to produce a spark of sufficient intensity at the same time that the starting motor is drawing current to turn the engine over. Often time in such cases the engine may be started by hand, thus preventing an excessive draw on the battery.

If no spark is produced when you try test c and the battery is not discharged, as indicated by tests in d above, then make the following tests to try and locate the difficulty:

(a) Observe the voltmeter indication, and if with the engine idle it indicates less than 11 volts when the lights are turned off, the battery is run down.

(b) If the lights do not burn when they are turned on, there is probably a loose-connection in one of the wires from the battery.

(c) If the lights do burn when they are turned on, try turning the ignition switch "off" and "on" several times and then test for ignition spark again. If the ignition now is found to be all right, there was a poor contact at the switch.

(d) If these tests and suggestions do not remedy the difficulty, there may be a loose connection or broken connection in the various wires running to the ignition switch or in the low-tension wires running to the ignition unit.

(e) If the switch wires and all connections are found in good order, remove the distributor plate and see that both brushes are free in their holder and making good contact. Clean the brushes and contacts inside the distributor plate and try again for the spark.

(f) If these tests have not yet remedied the difficulty, raise the interrupter cover and see that the interrupter contacts touch and separate properly when the segments come in contact with the fiber bumper. If these contacts do not close, if they appear to be dirty or if they separate more than .008 in. they should be adjusted.

It sometimes happens that the engine is firing on all cylinders, yet it does not develop its usual amount of power. The difficulty is more than likely due to the spark being retarded too much, or too rich a mixture of gasoline.

If the engine misfires on certain cylinders at all speeds, the following tests should be made to determine the difficulty:

(a) Disconnect the spark plug terminal of any one of the cylinders that misfires and hold the end of the terminal about 1/32 in. from the engine cylinder but not quite in electrical contact, while the engine is turned over. If a spark occurs in the gap between the end of the wire and the cylinder, the trouble is not due to the electric system being out of order but in the spark plug, valves or piston.

(b) If no spark is produced after the above tests are made, examine the spark plugs of the cylinders that are missing to see that they are cleaned, the insulator is not cracked and that the gap is adjusted properly.

(c) If no spark is produced while making tests in (a) the difficulty may be due to the high-tension lead from the distributor terminal to the spark plug being broken, the connector at the distributor may be loose, the wire may be bare and touching some metal part of the frame or engine.

The engine may misfire at either high or low speeds only and in such cases the difficulty is probably due to the following causes. If it misfires at low speeds, the carbureter is more than likely out of adjustment; the plugs may be fouled, or the interrupter contacts may be a little dirty. When the engine misfires at high speeds only, the carbureter adjustment is feeding too rich a mixture into the cylinders, or the interrupter contacts may be too far apart.

Back- firing of the engine is not always due to the ignition system but may be caused by the spark being advanced too far or the engine being out of time.

ENTER THE NATURAL GAS ENGINE

Bryan, Ohio, March 15—A motor car engine that operates on natural, or coal, gas has been invented by George W. Wetmore of this city. The gas is compressed into a coil of copper pipe at a pressure of 350 lb. A reducer valve brings the gas down to 60 lb., and the compression is used as a starter. The carbureter is done away with, and a mixer is used.

The engine is two-cycle with three cylinders with the Wait patent sleeve-valve in the head. The valve rotates the whole length of the cylinder with one connection to the shaft, which operates the sparker with an advance spark movement. The storage coil receives gas equal to 10 gal. of gasoline.

TO MAKE NEW TUBES

Cincinnati, Ohio, March 15—The Ross-Lambert Rubber Co. has been organized with capital of $3,000,000 to manufacture inner tubes of a new model. They are known as the truss type.

The company also will manufacture other rubber accessories. The concern is negotiating for a site near Cincinnati, and the directors hope to have a plant in operation within two months. It is claimed that a large order from the British government has been booked. The officers are: Charles E. Ross, Columbus, president and general manager; C. H. Lambert, Hartwell, Ohio, vice-president and secretary; and A. B. Lambert, treasurer.

AKRON-CLEVELAND EXPRESS

(*Concluded from page* 31)

more direct line through Iron Bridge, Steel's Corners and Northfield. The Federal Government and the state will share equally in 35 per cent of the cost of the new road; Summit County 30 per cent; the three townships through which it passes, 15 per cent in all, and the abutting property owners for one-half mile back from the road on either side, the remaining 20 per cent. Although only $600,000 worth of bonds have been provided for, it is estimated that the new road will cost approximately $800,000.

TRUCKS FOR WAR OPTICIANS

Washington, March 15—Motor trucks will perform another new service in France. Various makes of 5-ton military trucks are being equipped with complete shops to manufacture lenses for spectacles for our soldiers.

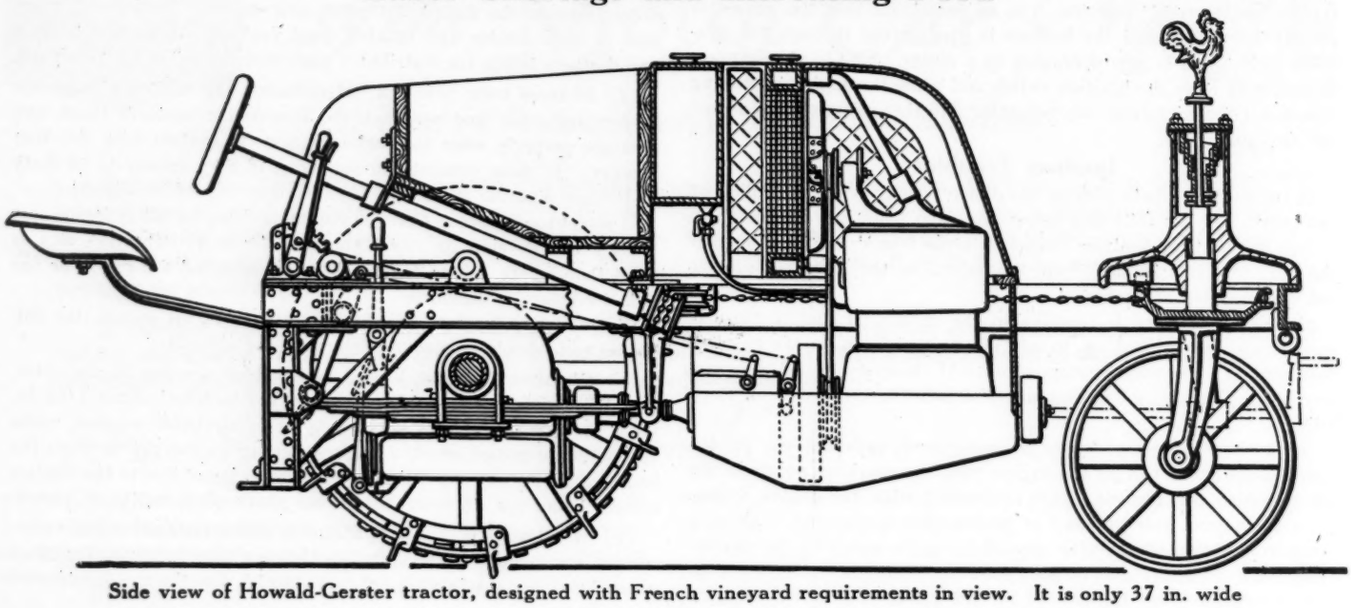
The trucks will operate within 15 to 50 miles of the front lines and will insure glasses for every soldier requiring them. Stocks of optical glass and the parts of spectacles and nose-pieces will be maintained at base depots in large quantities and will be carried on board the trucks in such quantities as best can be handled in this way.

They will be equipped with cabinets having drawers particularly adapted to this stock, machines for grinding lenses to give them a cylindrical surface, machines for producing spherical surfaces, automatic and hand operated edge-grinding machines, tools, gages, etc.

There will be four men on each truck, two drivers and two optical repairmen, who will make the lenses.

New French Tractor Designed

Howald-Gerster One of Means of Relieving Labor Shortage and Increasing Food



Side view of Howald-Gerster tractor, designed with French vineyard requirements in view. It is only 37 in. wide

By W. F. Bradley

Motor Age special correspondent with the armies in France

OFFICIAL France realizes that during the next few years thousands of agricultural tractors will have to be put into service to relieve the shortage of labor caused by the war. At the present time most of these tractors are being brought from abroad, owing to the inability of the home factories to produce. Immediately after the war, however, it is intended France shall produce her own tractors, and already business men and factory owners are studying this question and motor car manufacturers in particular are turning to the agricultural tractor as an article which is likely to keep their enlarged factories busy. On the other hand the French agricultural department is encouraging inventors to produce tractors suitable for French conditions and has instituted a technical section which examines all new designs, reports on them and when considered suitable endeavors to interest manufacturers in their production.

In Production Soon

One such tractor, considered by the French government officials as a most interesting type, is the Howald-Gerster, the patents for which are held by M. Howald, with the motor car engineer S. Gerster responsible for the general design. This tractor has interested one of the leading French motor car factories and will be built by it in a short time.

Foreign agricultural tractors rarely take into consideration the fact that to work in French vineyards the overall width of the machine must not be more than 39 in. Also on small holdings the tractor must have a short turning radius, and while designed for work in the fields it must be capable of operating on macadam and paved highways. Even French manufacturers have preferred, up to the present, to build a machine for large farms and open fields rather than for the small farms and for use between vines.

The Howald-Gerster has been designed with French vineyard conditions prominently in view. The width of the machine is 37 in., allowing it to go between vines, which are always 39 in. apart. In a country where gasoline is costly, weight has had to be kept as low as possible and the engine is no bigger than is necessary for work to be done. Mechanically the feature of the machine is independent worm drive to each of the rear wheels, it being possible to transmit the power through a differential to both wheels, or to either one or the other, as desired. By this feature, the machine, which has a wheelbase of 75 in. and an overall length of 130 in., can turn in a circle of 90 in. radius, or only a little more than its own wheelbase.

The tractor is of the four-wheel type with two main frame members solidly united by transverse members and is driven by a four-cylinder cast-in-block engine of 62 by 145-mm. bore and stroke, about $2\frac{1}{2}$ by $5\frac{7}{10}$ in., developing 10 hp. at 1000 r.p.m. Except for its simplicity there is nothing very distinctive in the engine. It has a two-bearing crankshaft and force-feed lubrication to all parts, including the wrist pins. Ignition is by high-tension dust-proof magneto. The carbureter is a standard make. Cooling is by thermo-syphon water circulation. The radiator is set back of the engine not only to give greater accessibility but to prevent dust from being drawn in. As will be seen from the design, cooling has been well taken care of by the provision of a big head of water and straight, big diameter inlet and outlet pipes. There is a fan in front of the radiator, the two blades of which sweep the entire cooling surface. The fan bracket is mounted on the water outlet collector, and the drive is by a V-belt from a pulley on the crankshaft just ahead of the flywheel. An inverted cone clutch, lined with Thermoid, is made use of, the clutch being independent of the flywheel.

Three-Speed Gearset

Bolted to the base chamber is a three-speed gearset within a cast-iron housing. From this gearset the drive is taken by a short propeller shaft to the rear axle housing. A broad-faced spur pinion on the extremity of the propeller shaft meshes with two pinions slightly offset in relation one to the other on the two underneath worm shafts. The driving pinion has a sliding motion on its shaft and only meshes with both worm shaft pinions when in its central position. Brought fully forward or pushed fully to the rear, it engages one road wheel only, leaving the other free. By reason of this feature of the design, the machine, which has a wheelbase of 75 in. and a total length of 130 in., can turn in a radius of 90 in. To further facilitate turning there is an independent brake on each of the worm shafts, making it possible to lock the wheel not receiving power.

As the machine is intended for use on roads as well as over soft ground, it is suspended front and rear. The rear suspension consists of a pair of semi-elliptic springs passing under the axle and shackled at their forward ends to brackets immediately below the frame members. These springs provide for the torque. The drive is transmitted through a flexible connection consisting of three- or four-leaf flat blade springs riveted together and uniting the upper central portion of the axle housing with the transverse rear frame

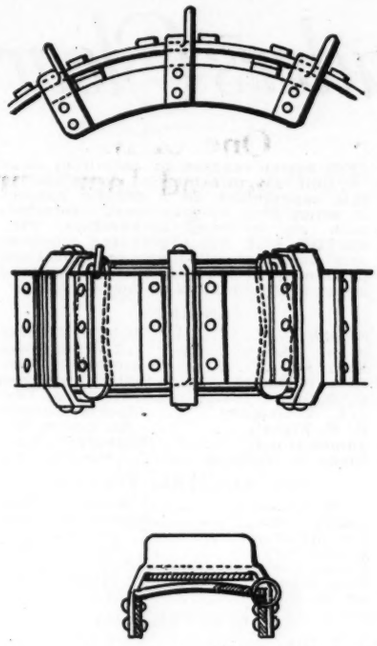
member. A French patent has been obtained on this general layout.

Another patented feature, adopted to make the tractor suitable for road or field, consists of detachable strakes for the driving wheels. The rims of the wheels are fitted with ribs of sufficient depth to give adherence on a made road. The detachable strakes employed on soft ground are united in series of three by curved lateral plates having the same curvature as the wheel rim. When these strakes, with their lateral plates, have been placed in position on the rim of the wheel, they are held by two flat blade springs, the center portion of each spring exerting a pressure against the inner face of the rim and the two ends dropping into notches on the side plates. No tool other than a hammer is required to dismount the strakes. When the end of the spring has been knocked out of its notch, it can be placed diagonally in relation to the strake and drawn out. This system gives ample security while avoiding the use of bolts and nuts.

The steering wheels, which have a diameter of 23.5 in. and a rim width of 3.1 in., are mounted on a central pivot and fork with suspension by a rectangular section coil spring. The wheels are set very close together but can be widened when desired for work on the road. A similar system of variable track has been adopted for the driving wheels. While the minimum track is 37 in., it can be increased to 51 in. by the interposition of couplings on the axle. Steering is by a motor car type wheel, an inclined column and a pulley with chain, the ends of the chain being attached to the arms of the pivot and fork. The driver's seat overhangs the rear of the tractor, being sufficiently high to give him a good view ahead and at the same time to enable him to control the plow or other agricultural machine he may have in tow.

To Have Two-Blade Plow

This tractor is intended to haul a two-blade plow and to cultivate to a depth of 6 in. The tractive effort required for this work varies from 660 to 880 lb. On second gear, which is the one generally employed for plowing and corresponds to a speed of 3 ft. a second, or 2.05 m.p.h., the tractive effort at the drawbar is 680 ft. when plowing to a depth of 6 in. over a width of 20 in., in average earth having a density of 5.5 lb. per square inch. The required tractive effort corresponds to 3.7 hp., and as the engine actually delivers 6 hp. at the drawbar, the margin is quite sufficient. On low gear the tractor advances at the rate of 2 ft. per second, or about 1.3 m.p.h. On third gear the rate is 4.5 ft. a second, or a little more than 3 m.p.h. It is intended that practically all plowing shall be done on second gear and road haulage only on third. On average ground, advancing at the rate of 3 ft. per second, with a two-blade plow covering a width of 20 in., the surface turned over is 300 sq. ft. per minute. During a 10-hr. day, the machine can plow 3.8 acres of heavy ground and 5.4 acres of light ground. This estimate makes an allowance of 10 per cent for time lost in making turns, filling tanks, oiling, etc. The tractor is handled in practically the same way as a motor car with a three-speed gearset. The only difference is two brake pedals, one for each



Detachable strakes on driving wheels of Howald-Gerster

worm shaft, and a separate lever to enable the drive to be transmitted to left- or right-hand wheel, or both, as desired. It is estimated that this tractor will be put on the market at an inclusive price of $1,700. Supposing that conditions revert to what they were in 1914, the tractor will be sold after the war at $900 complete. Calculating on 250 working days a year and a useful life of six years, during which time the initial cost will be entirely wiped out, the average daily cost is $10.84 under war conditions and $5.12 under peace conditions. These figures are based on European conditions, where gasoline and oil are high and labor relatively cheap.

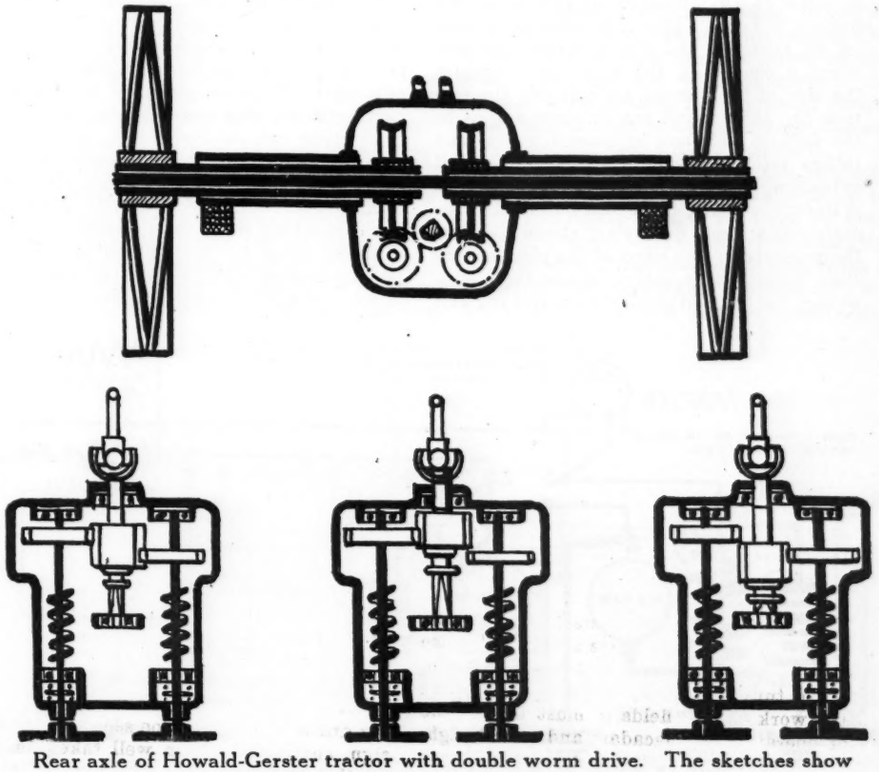
FORMER STUDEBAKER PLANT

New York, March 15—The Commercial Motorbody Corp. has leased the former Studebaker plant No. 5 at Detroit for use as a warehouse. The corporation is developing a system of warehouses for commercial bodies and accessories, and as rapidly as possible warehouses will be opened in various cities where cars and trucks are manufactured to centralize the distribution of commercial bodies. The warehouse in Detroit offers 90,000 sq. ft. of floor space and will open for business this week. Negotiations are under way for similar plants in New York and Chicago, which will be added April 1.

Arrangements have been made with more than 100 makers to assure an adequate supply of bodies to meet all demands. The officers are: President and general manager, P. H. Patriarche; vice-president, Charles M. Eaton; second vice-president and assistant general manager, Addison G. Brown; secretary, J. Greenway Bain.

NEW ROWBOAT MOTOR

Detroit, March 15—The Caille Perfection Motor Co. is putting on the market a new little outboard motor for rowboats. It will be called Liberty drive and will retail for $48. Besides the low price it has other attractive features. Power is transmitted direct from the crankshaft to the motor, and the latter is so mounted on a swivel that the boat can pass over an obstruction without in the least causing damage to the propeller blades. It is planned to build 5000 of these motors this year.



Rear axle of Howald-Gerster tractor with double worm drive. The sketches show how one or both wheels are driven

The Readers' Clearing House

Engines

Ford Helical Timing Gears

Q —WHAT is the name of a firm making spiral timing gears for Ford engines?—Reader, Lethbridge, Alberta.

These can be obtained from the Detroit Gear & Machine Co., Detroit.

Graphite in Ford Engine

Q.—Would the use of dry graphite be advisable in the valve chambers of the Ford engine?—W. W. Bissell, Zearing, Iowa.

The Ford company does not advise the use of graphite in the engine. The reason advanced is that the substance is likely to find its way into the magneto and as it is a good conductor of electricity, it is likely to short-circuit the latter.

Counterbalancing Crankshaft

Q.—Is a crankshaft perfectly balanced using the same weight on the other side of crank or would it be more balanced if it were round instead of bolting on the opposite side?—B. D. K., Moundridge, Kan.

The counterbalance weights should be of such size that they will neutralize the force set up by the weight of rotating parts. The rotating parts include the crankshaft and that part of the connecting rod that is in rotating motion. The nearer this weight can be located to the center of rotation of the shaft, the better the design. When the same weight as the throw is used as a counterbalance the shaft is not perfectly balanced for running balance while it may be in balance statically.

Wavy Lines in Cylinder

Sioux City, Iowa, Editor MOTOR AGE—We note in MOTOR AGE of Feb. 28 a subscriber at Oshkosh, Wis., makes inquiry as to cause of wavy lines in his cylinders. We believe if he will place his connecting rods on an arbor at the crank throw end and place a square on the arbor and against the side of the pistons, he will find the pistons are cocked and not at right angles to the arbor. This can be caused by various things too numerous to mention. Cocked cylinders will cause wavy appearance on cylinders, causing the pistons to chatter in their upward and downward strokes, due to the pressure of one edge of the piston more than opposite side, which causes the piston to rock on the piston pin in its upward and downward motion, causing wavy lines or blurs on the cylinder.

In a high-grade car like his Super-Six no doubt if he finds cocked pistons it is due to a slightly distorted connecting rod and all that is necessary is to use a stiff rod that will enter the piston pin after bolting connecting rod at the crank throw end of the connecting rod on the arbor, in exerting the proper upward or downward pressure on the piston pin to bring the piston at right angles with the arbor by springing the connecting rod. Care should be taken that the arbor be .001 or .002 larger than the connecting rod bearing at the crank throw end and in tightening the bearing to the arbor that the shims are brought together and the bearing bolts are snug to avoid springing the bearing back. If the inquirer's pistons are cocked he will most likely get a chatter in his engine when it is driven at extreme high and sustained speed and it can also be heard if the engine is raced for a sufficiently sustained period.—C. A. Kneedler.

TO assist readers in obtaining as a unit all information contained in this department on a certain subject in which they may be most interested, such as ignition, carburetion, etc., MOTOR AGE has segregated inquiries into classes of allied nature. Questions pertaining to engines will be answered under that head, and so on.

ENGINES

Reader.....Lethbridge, Alberta
W. W. Bissell.....Zearing, Iowa
B. D. K.....Moundridge, Kan.
C. A. Kneedler.....Sioux City, Iowa
B. Raines.....Stanford, Tex.
J. L. A. Calgary.....Alberta, Canada
E. F. Fishell.....St. Louis, Mo.
James Hurd.....Hickerson, Kan.
Glenn E. Norman.....Nevada, Mo.

THE ELECTRIC SYSTEM

C. M. Cluver.....Beatrice, Nev.
Henry Jebe.....Anaconda, Mont.
Leo Miller.....Bisbee, N. D.
Subscriber.....Abilene, Tex.
Subscriber.....Zeeland, Mich.
Otta Stoa.....Sacred Heart, Minn.
W. W. Bissell.....Zearing, Iowa

MISCELLANEOUS

J. T. Greenlee.....Fort Bliss, Tex.
W. W. Bissell.....Zearing, Iowa
B. D. K.....Moundridge, Kan.
George Hesse.....Chicago
David N. Singer.....Lexington, Ky.
Victor E. Nelson.....Prophetstown, Ill.
P. F. Stahl.....Meyersville, Tex.
S. W. Alter.....Forest, Ohio
A. V. Marrow.....St. Louis, Mo.
T. Roberts.....Ottawa, Canada

REBUILDING

B. Raines.....Stamford, Tex.
C. J. Marshall.....Memphis, Tenn.
T. Roberts.....Ottawa, Canada
Carlo Jorgenson.....Minot, N. D.
T. T. Beynor.....San Antonio, Tex.

No communication not signed by the writer's name and address will be answered in these columns.

Bore and Stroke of 1912 Hudson

Q.—What is the bore and stroke of a 1912 Hudson 33?—B. Raines, Stamford, Tex.

The bore and stroke are 4 by 4.5 in. respectively.

Carbon Removers in Engine

Q.—Discuss the advisability or inadvisability of putting carbon-removing preparations in the cylinders of a car.—J. L. A., Calgary, Alberta, Canada.

If you have read the experiences of other motor car owners which appear in the Readers' Clearing House, you doubtless have noted that they are in favor of using them. Carbon removers are not harmful to the metal of the engine, providing you get those made by reputable makers.

Valve Operation on White

Q.—Do two valves on a White sixteen-valve four-cylinder engine work at the same time? Explain.—E. F. Fishell, St. Louis, Mo.

The valves are operated by two camshafts, one on each side of the engine. Both of the valves performing one function for each cylinder open and close at the same time and remain open for the same period of crankshaft travel. The two valves act the same as one in the eight-valve type of engine.

Wrist Pin Locking Methods

Q.—Which construction is used the most, the piston pin fastened solid to the connecting rod with its bearing in the piston like the Ford or the piston pin solid in the piston with its bearing on the connecting rod?—James Hurd, Hickerson, Kan.

We have no accurate data regarding which method of locking the piston pin is most used. However, it is our opinion that the type with the piston pin locked in the piston is probably the most used. This is probably most used on account of the ease of replacing the bushing in the upper end of the connecting rod and the better opportunity to provide lubrication of the bearing surfaces.

Piston Slap in Ford

Q.—Why is a piston slap more noticeable in a Ford engine than in other makes of engines? Is not the rattle of worn timing gears often mistaken for piston slap and looseness in repair shops?—Reader, Lethbridge, Alberta.

There is no reason why the Ford engine should have a more noticeable piston slap than any other make. Piston slap usually is ascribed to worn or out-of-round pistons. A piston that is short in length in proportion to its diameter has a tendency to slap sooner than one with more length. Piston slap can be proved by injecting 600 W steam engine oil into the suspected cylinder and seeing if this stops the slap. The heavy oil will form a cushion momentarily so that the slap will be subdued. By this process the exact location of a piston slap

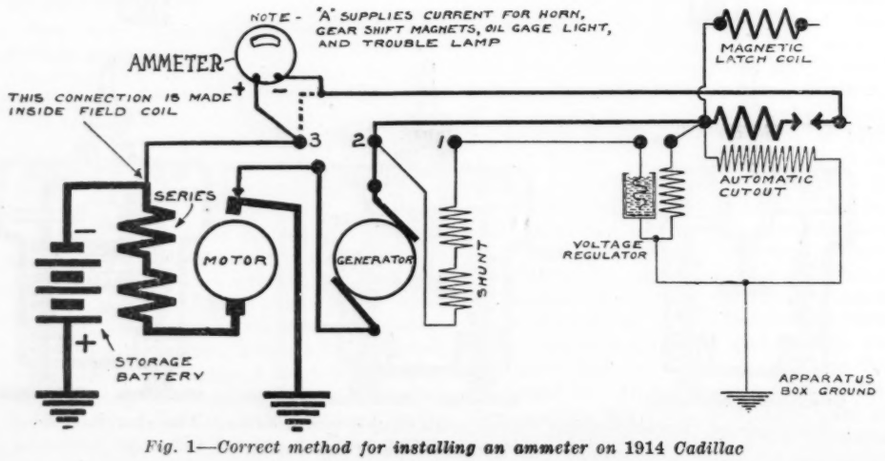


Fig. 1—Correct method for installing an ammeter on 1914 Cadillac

can be determined when one is in doubt concerning which cylinder is giving the trouble.

Timing gear noise can be eliminated by using a brake on the fan pulley so that the back lash between the gear is done away with. Thus one can also determine whether or not the gears are the source of trouble. The knock developed by timing gear is a very peculiar one and quite often is mistaken by repairmen for other troubles. End play in a camshaft will produce at high engine speeds a knock very similar to a connecting rod and it is only by the difference in speed of the noises that one can locate the real source of trouble.

Camshaft Wear in Chalmers

Q.—How may I determine wear in camshaft on Chalmers 30 engine?

2—What should the lift or valves be in this engine? Should intake and exhaust be the same?—Glenn E. Norman, Nevada, Mo.

1—If the camshaft bearings in this engine have never been renewed, they are sure to need it, provided the engine has been used considerably. To detect wear in the camshaft take off the bottom plate of the crankcase and slip out the valves and springs so there will be no tension on any of the cams. Now reach up into the case and grasp the camshaft, moving it up and down. If there is considerable shake in it the bearings are worn down too much and must be replaced. The chances are the timing gears are worn also. To take out the timing gears and camshaft proceed as follows:

Remove the taper pin which passes through the hub of the fan driving pulley and pull it off the shaft. The screws which hold the gearcase cover now may be removed and the cover taken off. These gears all are marked, and if for any reason they are removed, care should be taken in reassembling to see that all the gear marks mate up properly or the valves will not be properly timed.

The machine screw in front of the screw that holds the timer case to crankcase timer is the only thing preventing endwise motion of the camshaft. With the timing gears exposed and this screw removed the entire camshaft may be withdrawn from the front of the engine. Blocking the valve pushrods in their highest position will help this operation. The oil pump has no rigid connection with the camshaft but is operated by a cam on the latter.

2—The lift of the valves is about ⅜ in. You can measure the lift by ascertaining the distance from the top of one of the cams to the camshaft. The lift of the intakes is the same as that of the exhaust valves. This might vary with some engines, but in your case it holds.

Engine Runs Erratically

Q.—In driving an Empire 31 the engine works perfectly up to 15 m.p.h. Over that it will miss and run 1, 2, 3. It does not spit back in carbureter, which is a Holley. Has a strong spark and good compression. Valves have just been ground and are in good shape. Do you think the trouble is due to worn guides and weak springs?—James Hurd, Hickerson, Kan.

First adjust the spark plugs so they have a gap of $\frac{1}{32}$ in. Then check over the ignition breaker points and see that they are set in accordance with the manufacturer's recommendation. If this fails to stop the missing, then test the inlet manifold flanges for air leaks by flooding the joints with oil. The carbureter should be set so that the engine idles smoothly and the high-speed adjustment should be set so that when the engine is warm it will backfire through the carbureter with retarded spark when the throttle is thrown open. This will avoid having a rich mixture at high speeds, which will cause the engine to miss fire. In an old engine it is quite possible the trouble may be due to air leaking past worn valve guides and thinning out the mixture so that it results in missing.

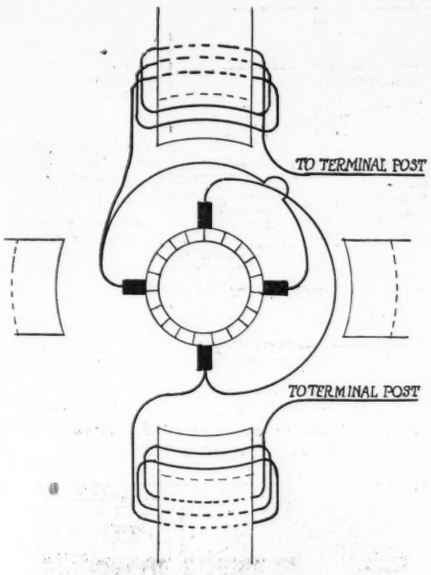


Fig. 2—Internal wiring diagram for motor on Overland 80

The Electric System

Wiring of 1917 Elgin

Q.—Publish a complete diagram of the 1917 Elgin six.—Leo Miller, Bisbee, N. D.

This diagram is shown in Fig. 3.

Ammeter on 1914 Cadillac

In our issue of Feb. 14 in answer to an inquiry of C. M. Cluver, Beatrice, Neb., the method for attaching an ammeter to a 1914 Cadillac appeared incorrectly. The correct method for placing an ammeter in this system is shown in Fig. 1. Remove the No. 3 terminal from the top of the motor generator and attach to the negative post of the ammeter. From the positive post of the ammeter run a similar piece of wire to the No. 3 terminal of the motor generator. The most suitable form of ammeter to be used for this purpose is one with a 10 amp. discharge scale, zero center and a 30-amp. charging scale.

Wiring Diagram of Overland 80

Q.—Publish internal wiring diagram of starting motor on the model 80 Overland.—Henry Jebe, Anaconda, Mont.

An internal wiring diagram for this model starting motor is shown in Fig. 2.

Armature Must Revolve for Spark

Q.—Is it possible for a car having a Mea magneto and no other source of ignition to fire and start on compression by giving the spark lever a sudden jerk?—Subscriber, Abilene, Tex.

To have current generated for ignition the armature must revolve. In the operation that you have described the armature does not revolve, therefore no current will be generated for ignition. Starting cannot be accomplished by this method.

Adjusting Wagner Generator

Q.—Can a Wagner generator be adjusted so as to increase its charging rate?—Subscriber, Zeeland, Mich.

The adjustable exciter brush on the Wagner generator is sealed in place where the screw holding it passes through the slot in end head. This adjustment is made at the factory and should not be tampered with. If this seal is broken it immediately invalidates Wagner guarantee on equipment.

If your battery continues to run down and apparently the generator does not charge fast enough to keep the battery full, it might be well to measure the charge current as follows:

Place an ammeter in the circuit as shown in Fig. 5, using No. 2 B. & B. copper cable in just as short lengths as possible. Place a voltmeter scale, 0—30 volts, in circuit by connecting one terminal of the voltmeter to the terminal X of the generator. Connect the other voltmeter terminal to one of the bolts on the generator by raising the bolts and then tightening in down on the wire. Use the size wire mentioned. If smaller wire is used the increased resistance will act the same as a loose connection, and your test will be incorrect.

Start the engine and take the readings of amperes and volts for car speeds up to 25 m.p.h., taking several readings between 8 and 25 m.p.h. The maximum charging current should not exceed 15 amp. with a corresponding generator voltage of 9.2 volts. This maximum voltage should occur

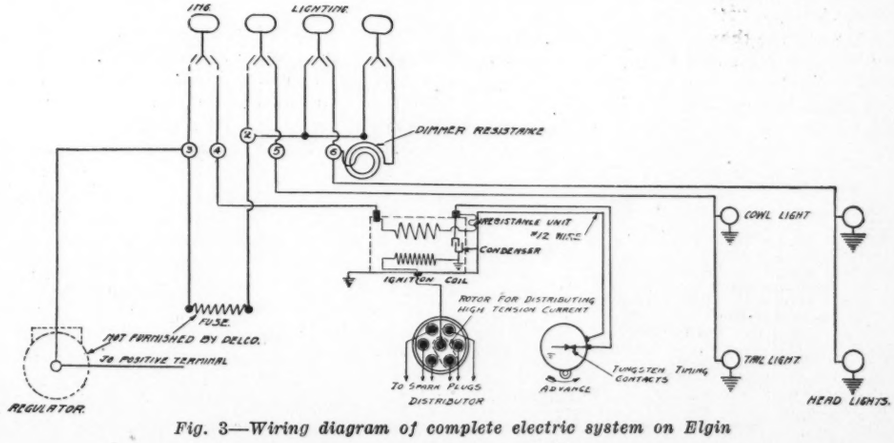


Fig. 3—Wiring diagram of complete electric system on Elgin

at a car speed of from 15 to 20 m.p.h. The charging current will decrease at higher car speeds so as not to overcharge the battery while touring at fairly high speeds.

If you find the maximum charging current materially below these values, it does not mean necessarily that the generator is set improperly but more likely that the battery sulphated, due to standing idle without attention, or else the generator, brushes and commutator need attention.

If you find the charging amperes and voltage materially higher than these values, it means that there is some unnecessarily high resistance in the charging circuit. There may be a loose connection on the generator, relay, battery or indicator. A loose connection sometimes will cause the lights to flare up to excessive brilliancy or to flicker and go out. See that the lamps are of the same size as originally furnished.

If a great deal of driving is done at night with all lights burning and if it is necessary to have the car left standing with all lights burning, this will demand excessive current from the battery. Always turn out the headlights or turn on the dimmers when the car is standing still for any length of time.

Also keep the generator free from moisture. Ordinary moisture will not affect the generator, but it should not be allowed to become thoroughly wet. If the generator is wet it should not be operated again until thoroughly dried out. Good condition of the battery is absolutely essential to the proper operation of the generator, lights and starter.

Before you make any attempt to change the charging rate of the generator we suggest that you check up on these points and make sure everything is in order. If your trouble persists, better consult a service station.

Ammeter on 1915 Hupmobile

Q.—In installing an ammeter in a car using the single-wire Westinghouse system where the wiring is such that ammeter cannot be made to show both charging rate and battery discharge, as on Hupmobile 1915, should the ammeter be installed so that the entire generator output passes through same, or should one terminal be connected to the proper generator terminal and the other one to a ground?—W. W. Bissell, Zearing, Iowa.

If you install an ammeter in the lighting circuit as shown in Fig. 4, it will show discharge only. On the other hand, if you put an ammeter in the charging wire, going from generator to battery, it would show charging rate only. If you wanted to go to considerable trouble you could install two instruments on the dash, one to show charge and the other discharge. By watching the two you could ascertain whether or not the lights, etc., were drawing more current than the generator was putting into the battery.

Sparks Appear on Engine

Q.—I have an Overland, model 60, 35 hp., with a type S Remy magneto and coil. What is the cause of a faint blue spark jumping between manifold stud marked A and carbureter air control rod B? I can draw a faint spark from any place on the engine or frame with engine running. One expert said it was because of a defective coil, while a second man claimed the magneto was the cause. We have tried this coil on another car and there was no sign of any trouble there, but the same spark showed with the coil from the other car on this one. The wires seem to be in good shape all over. Would a defective distributor board on the magneto be the cause of it?—Otto Stoa, Sacred Heart, Minn.

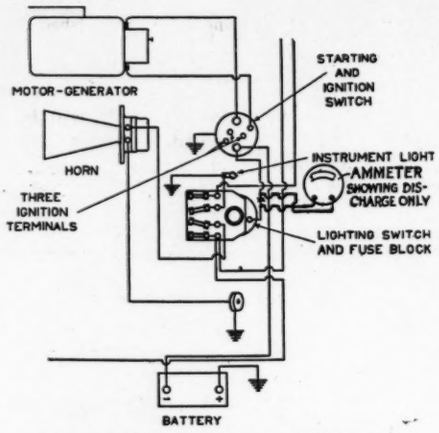


Fig. 4—Wiring ammeter on 1915 Hupmobile to show discharge only

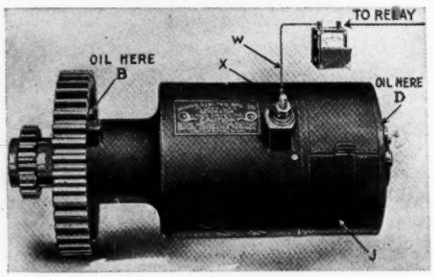


Fig. 5—Measuring charging current of Wagner generator

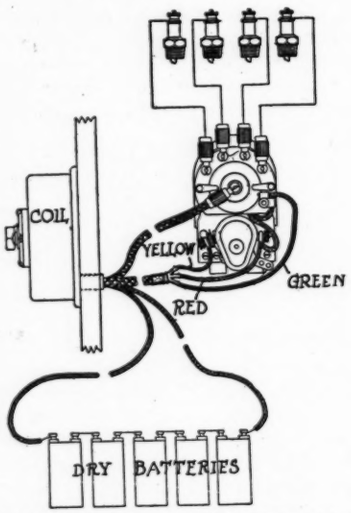


Fig. 6—Wiring diagram of Remy system on Overland 60

We believe your trouble is in the wiring. There may be ground somewhere in the system which is causing a wild current at the point A or any other point where some of the metal parts may be separated slightly. We suggest that you ascertain the condition of the lead going from the coil to the magneto, examining all the terminals, etc., to see that they are in order. The proper way to make the connections is shown in Fig. 6. A cracked distributor board possibly may cause such trouble as this, as it would allow current to find its way to the metal of the engine. There also is a possibility that a current is induced from the secondary. Should the wire going from the coil to the magneto be grounded in any way, a spark could be produced at the point A or any other point for that matter, if the metal were separated. The action is the same as in a spark plug. Troubles of this kind in most cases are traced down to the wiring, which may be defective at one or more points.

Miscellaneous

Relation of Friction to Braking

Q.—Is friction proportional to bearing area or to pressure? Will you give and explain the physical law governing this? What is its relation to brake surfaces?—Sergt. J. T. Greenlee, Fort Bliss, Texas.

Friction is that force which acts between two bodies at their surface of contact. It is independent of area and depends upon the force with which the two bodies are pressed together. The coefficient of friction is the ratio of the force required to slide a body along a plane horizontal surface to the weight of the body. Friction of rest is greater than friction of motion.

It has been found by experiments that the quickest stop by brakes can be made when the retarding force is just great enough to not quite lock the wheels but to have them continue to revolve. Brakes should be made powerful enough so that they will lock the wheels on a dry road. If it is assumed that 0.6 of the total weight of the vehicle is on the rear wheels and the ground adhesion is 0.6 then the distance in feet required to stop a vehicle can be determined from the equation $x = \frac{V^2}{10.8}$ where V is the car speed in miles per hour.

In regard to the size of brakes it is considered good practice to have 1 sq. in. of braking area for each 15 lb. of car weight for passenger cars. The rear wheel brakes of motor trucks should have about 1 sq. in. of braking area for each 30 lb. of weight loaded and for propeller shaft brakes running at engine speed about 1 sq. in. of area for each 175 lb. of weight loaded. Jackshaft brakes should have about 1 sq. in. of area for each 85 lb. of weight loaded. These specifications will give you some idea of the size of brakes required for different vehicles.

Three considerations determine the size of brakes. They must be powerful enough to slip the wheels. The radiating surface must be large enough to prevent excessive heating on long grades. They must be large enough to insure a reasonable life for the brake linings.

Larger Wheels Versus Gears

Q.—In rebuilding a Ford for speed work why would not the use of larger wheels and tires be preferable to installing gears of a different ratio in the rear axle?—W. W. Bissell, Zearing, Iowa.

In the first place it would be far more expensive and, secondly, the center of gravity would be raised. Also it would increase the peripheral weight of the wheels so that acceleration would not be as good.

Records by Chalmers

Q.—Did the Chalmers car that made those records on Sheepshead Bay track of 1879 miles in 24 hr. use a stock engine? What was the bore and stroke? Did it use thermosyphon cooling.—B. D. K., Moundridge, Kan.

This car was a stock car with a special gear ratio. On account of the lightweight racing body being much heavier than the stock body it was found necessary to move the engine back to preserve the original

balance of the car. The Chalmers engine was used in this car. It had a bore of 3¼ in. and a stroke of 4½ in. The standard cooling system was employed.

Welding Broken Flywheel

Q.—My Knox 40 speedster was driven into a locust stump and came out on the short end. The flywheel was broken out in the center, a clean fracture, the sleeve of the flywheel cover plate was cracked and sprung out of shape and the driveshaft plate had a small section broken out. Do you think it would be practical to have these castings welded?

2—Provided the flywheel can be repaired without having to cut too much metal away to bring it true, would it be reasonably safe against fracture and would its balance be disturbed?

3—Do you think the sleeve of the flywheel cover plate could be welded successfully, not losing sight of the fact the sleeve of the same is sprung out of shape?

4—Would the driveshaft plate warp when being subjected to welding? This has to be perfectly flat.

5—The steel driveshaft sleeve also is sprung, but I think this can be heated and pounded or pressed to near-true shape and then finished in lathe.—David N. Singer, Lexington, Ky.

1—It is hard to advise you in regard to welding these parts, inasmuch as we cannot see them, but we believe you will be safe in having them welded. Thousands of dollars have been saved by this process not only in the motor car field but in practically every branch of industry where metal is used in any form. The oxy-acetylene process is a very successful method of fusion welding suitable for a great variety of work.

The temperature of the oxy-acetylene flame is about 6300 deg. Fahr. and the effect of this tremendous heat at the point of treatment is to bring the metal very rapidly to a molten state so that it flows together and mixes thoroughly with proper quantity of metal added by the operator to fill the crevices. The molten mass thus formed does not merely cement the pieces together but fuses them into one piece.

2—We believe there would be no danger of fracture and as far as disturbing the balance is concerned, this could be adjusted properly.

3—It could be welded but would have to be straightened first.

4—There is not much chance of the plate warping, as the flame is confined to a small area and not spread over the surface.

5—Whether or not this part can be straightened will have to be determined by you or someone competent to judge on such matters. We suggest that you take up the whole matter with some concern specializing in this kind of work. Nearly every garage nowadays is equipped with a weld-

These Are Others' Experiences—What Are Yours?

Auxiliary Air Devices

New Plymouth, Idaho, Editor MOTOR AGE—I would like to give my experience with gas savers and putting steam into intakes. My first car was an Overland, 69-T, 1913. I bought a Lydan gas saver and put it on and after starting car warming engine, I would turn on the air and the car would be running about 10 m.p.h. As soon as I turned the air on, the car would speed up to 25 m.p.h. I then piped the steam from the radiator overflow pipe at the bottom and coiled the pipe three times around the exhaust pipe and put the steam into the intake through the gas saver. I have never had any trouble with carbon. I got 17 miles from a gallon of gasoline in the coldest weather and as much as 20 in warm weather.

I now have an Oakland six 34, 1917. This winter I have had quite a little trouble with the spark plugs fouling and missing, so I had the tinner make a copper can like a tomato can, except it is concave on the bottom. It will hold a little over a pint of water. I hung the gooseneck on the intake that sucks the gasoline out of the tank into the carbureter, put in a tee and copper pipe from end of tee to my copper can, wrapping it once around the exhaust pipe. From the other end of tee on copper can I put a copper pipe with a petcock, with one end on shaft of steering gear and use it to take air in through copper can on exhaust pipe. I have only installed it a few days and my car runs much differently. I haven't the least trouble with the spark plugs, and seem to have a great deal more power. I cannot tell how much gas it is saving, because I have not had it long enough to test it. It certainly has made a great difference in the running of my car, and the cost was not over $2.—Thomas Weir.

Auxiliary Air and Heated Manifold

Akron, Ohio, Editor MOTOR AGE—Several years ago I used an auxiliary manifold air intake on a four-cylinder Reo, but after giving it a thorough tryout and finding that it did not increase my mileage or prove of benefit in any other way I discarded it. About two years ago I purchased a Little Six Buick touring car and after several months' use, during which I secured from 15 to 17 m.p.g. of gasoline, I decided to try some kind of preparation to give more volatility to the then low-test gasoline we were using. I tried Gaso-tonic, a liquid preparation manufactured by the Gaso-tonic Co., Cincinnati, Ohio. This came in quart cans and cost $2 per can. It was added to the gasoline as the latter was filled into the car tank. The quart can was supposed to treat 200 gal., thus adding 1 cent a gallon to the cost of the gasoline. My engine immediately seemed to have more pep and snap and my mileage soon rose to 21 or 22 m.p.g.

I also had less bother with carbon, after commencing its use. Almost needless to say, I continued to use it up to this time and shall continue to do so. Would say further that as the quality of gasoline we secured in this terrtiory continued to grow poorer I decided about last July to make a further addition to my car by installing a Wilmo manifold, which has proved very satisfactory and which has increased the efficiency and flexibility very greatly. I can now get from 26 to 27 m.p.g., which is practically double the mileage of similar cars, this, of course, under the most favorable circumstances.

I pay considerable attention to the proper lubrication of the car and reduce the friction to the lowest point possible. I use the best quality oil and grease obtainable regardless of cost, arguing that oil and grease are cheaper than machinery. I have the adjustments and lubrication down to such a point that although my car weights 3000 lb., I can move it on the level floor with one finger. The satisfaction I secure in the driving of my car is regard to mileage, power and flexibility is such that I believe that I am justified in the care and attention I give it.

I have also used Johnson's carbon remover with considerable success. I use this according to directions, possibly every three months, and it keeps my engine clear, or practically so, of carbon, thus eliminating the necessity of grinding my valves once a year.

I would like to say something on taking care of the appearance of the car, as follows: If you have any pride in the looks or appearance of your car, never allow it to be washed with soap. I do not believe there is any soap or soap preparation that will not dull the finish if used several times. Never allow the use of anything but cold or lukewarm water, spraying the finish without much pressure and thus carefully soaking off the dry mud. Then sponge off without using much elbow grease and finish with a chamois wrung out in water. If after several such experiences there appear grimy spots of places, remove these with Johnson's cleaner, chamois off clean when thoroughly dry, apply Johnson's liquid wax evenly and as lightly as possible, by just moistening a piece of cheese cloth with the wax sufficiently so the body will appear wet when applied. Leave stand several hours or a half day, if necessary, to secure a nice polish with a piece of dry cheese cloth briskly rubbed over the finish. If mud has been allowed to remain on the finish long enough to dull it, this treatment will bring back the original shine and preserve the varnish My car, two years old, has been driven through all kinds of mud and bad roads, washed dozens of times and with this treatment looks better than the average car at a month old if it has been washed once or twice with soap.

If grease is to be removed from the chassis, I use an old clean paint brush and kerosene to remove the accumulation, then after it has drained off, I use a cloth, dampened only, with gasoline to remove the oily surface occasioned by the use of kerosene. I suppose some folks will say that this is useless treatment and that they have not the time to put all this over a car, to which I wish to say that cars given this kind of treatment, last five or six years, always look and run well and bring a good price when sold. Will say that in twelve years' use of four cars, I never had 15 min. of trouble on the road, outside of tire trouble and very little of that, as I keep all small cuts vulcanized and in good repair and frequently get from 5000 to 7000 miles service out of a set of tires, all of which leads me to conclude that most of the trouble and expense comes as a result of carelessness or abuse.—N. A. Maritz.

ing outfit, and the cost of having such repairs made is in the majority of cases not so great as buying new parts.

Maximum Speed of Overland 85

Q.—I have an Overland four, model 85. What speed is it able to attain?—Victor E. Nelson, Prophetstown, Ill.

We have no record of any official tests having been made on this model. However, the Chicago branch of this company states that the maximum speed is about 45 m.p.h.

Lubrication of Maxwell Clutch

Q.—Is a 1916 Maxwell cone clutch supposed to operate in a heavy non-fluid oil or is it a dry cone clutch?—P. F. Stahl, Meyersville, Tex.

The Maxwell cone clutch uses a non-burning fabric facing running in an oil bath. The clutch compartment requires about 1½ pt. of oil.

Stanley Steamer for Tractor

Q.—What do you think of changing a Stanley steamer into a tractor by a tractor attachment? Will the Stanley generate steam fast enough to to pull three 14-in. bottoms? The Stanley is a 1914, 20 hp.—George Hesse, Chicago.

The makers of the Stanley car do not advise using it in connection with any of the tractor-making devices. It is not likely that the Stanley engine could be used successfully under all circumstances to drive a tractor, and if the present passenger chassis were used the results would probably be the same as if you attempted to use a Cadillac or Packard, as built for passenger purposes, to tractor work.

Clutch Brake on Regal

Q.—Give method of putting a clutch brake on a Regal, model J.—S. W. Alter, Forest, Ohio.

It will be a difficult job to put a clutch brake on this model, inasmuch as the clutch is not exposed as on some models. We do not see how it is possible to do the work without going to great trouble. The only way you could tell whether or not it would be advisable is to take the clutch housing off and see how much room there is. Unless made sturdy clutch brakes are of little use, so if there is not sufficient room in the housing to accommodate one of ample dimensions, you had better not attempt the job.

Cleaning Honeycomb Radiator

Q.—I am having trouble with my engine heating. As everything seems to be O. K. indications point to an inefficient radiator. The car is a Ford and radiator is a special V-type honeycomb, which was very effective the first season but ineffective the second season. I believe trouble is due to scale or grease. What is the best method of removing scale inside of radiator?—A. V. Morrow, St. Louis, Mo.

Sometimes the dirt in a radiator can be removed by flushing with hot water. To flush the radiator remove it from the car and permit the water to run through it in the reverse direction. The reason for doing this is that the dirt settles in the top of the radiator core and if it is flushed in the reverse direction it will avoid carrying the dirt through the entire core. If the radiator will handle all the water the size of the outlet will permit it to discharge, then the core is not obstructed. However, if the discharge is very slow and does not loosen up after the hot water has flown through it for some time then some other method must be resorted to. If this treatment fails then an acid treatment probably will loosen any scale and dirt that may be in the radiator. Mix 4 gal. of water with 1½ gal. of 66-deg. Beaume sulphuric acid. Plug the radiator tight at the filler spout and fill the radiator with the acid solution from the outlet and let it stand for 10 or 15 min. In most cases one treatment will be sufficient. After draining the acid solution from the radiator flush it thoroughly with water. After this treatment the water should run through the radiator in a full stream.

If the engine still heats after the radiator has been cleaned then remove the cylinder head and examine the water jacket pockets. These sometimes become filled with the same sediment that blocks up the radiator and it will be necessary to clean them to get proper water circulation. Also make sure that the radiator hoses do not collapse when the cooling water becomes hot.

Oiling of 1912 American

Q.—Give diagram of the oiling system used on the 1912 American 30.—T. Roberts, Ottawa, Canada.

We have no diagram available showing the lubrication system of this car but can give you the process by which it is carried out.

When oil is poured in the crankcase it settles at the bottom of the crankcase proper. Inside the crankcase is a sheet metal trough with holes in the bottom to permit entrance of oil. When the engine stands idle the oil enters this trough from the crankcase until the oil level is the same in each. When the engine begins to operate, the small copper tubes, or dippers, on the bottoms of the connecting rods dip into this oil and force it up into the connecting rod bearings. The surplus oil is forced out of the bearings and thrown by the rotary action of the rods on the walls of the crankcase, or any mechanism such as the camshaft in the crankcase. This splashing of oil lubricates the walls of the cylinders. Any oil not actually used up by the bearings runs back on the walls of the crankcase and through the holes in the trough. As more oil is thrown out of the trough than can flow into it, owing to the small size of the holes, the level on the outside of the troughs will rise above that inside of it until the weight of the oil outside is enough to force just as much oil in through the holes as is thrown out by the connecting rods. By this means, the level of the oil in the crankcase is kept constantly correct for running, while for starting, when more oil is needed, the level is higher and more oil is thrown by the connecting rods.

An oil pump is provided that pumps oil to the sight feed on the dash. If the level of oil should fall below that necessary for proper lubrication, the pump will receive no oil—hence none will pass through the sight-feed. The oil level gage on the side of the crankcase will tell the amount of oil at all times.

Kerosene for Rumley Tractor

Q—Where can I get a cheap kerosene burner attachment for a Rumley tractor that will give good satisfaction?—T. E. Gough, Rush Center, Kan.

It is possible to change your tractor so that it will burn kerosene, but as it requires radical changes in the tractor's construction we do not believe that the expense involved in making the mechanical changes would warrant the gain.

Rebuilding

Rebuilding Hudson 33

Q.—Where can I get a set of wire wheels size 32 by 3½ for a 1912 Hudson 33?
2—What speed could I get out of this car with a 3 to 1 gear and 32 by 3½ wheels?
3—What changes could be made to make this car fast? Would you advise two carbureters?—B. Raines, Stamford, Tex.

1—We suggest that you write to the various wire wheel makers advertising in MOTOR AGE regarding wheels for your car. This is an old model and the wheels would have to be fitted with hubs specially made. This is so on account of the brake drums, bearings, taper of spindle, etc.

2—If you can get the engine to turn over at about 1600 r.p.m. the car speed would be something like 52 m.p.h. Of course, if you wanted to go to considerable trouble you could enlarge the valves, rebore the cylinders and fit lightweight pistons, put on a larger carbureter, advance the ignition, change valve timing, etc., all of which would add to the maximum speed. Just how fast it is possible to drive any car depends upon the condition of the car and the amount of preparation.

3—You might try the changes suggested, but before doing this see that there is no drag on the bearings and that the car can be rolled freely with a minimum amount of friction. Reduction of friction is just as important as putting in more power into the engine. As much of the engine power as possible should be utilized for propelling the car and not merely to overcome needless resistance. Be sure that the brakes are adjusted so they do not drag. Also the front wheel bearings should be just tight enough so the wheels do not wobble. Do not use too hard a grease in the transmission or differential. Not only does it afford resistance, but lubrication is impaired, as the gears merely cut a hole in the grease and the grease clings uselessly to the walls of the case.

If you expect to go in for speed work, set the engine a little farther back on the frame. Also make sure that the wheel

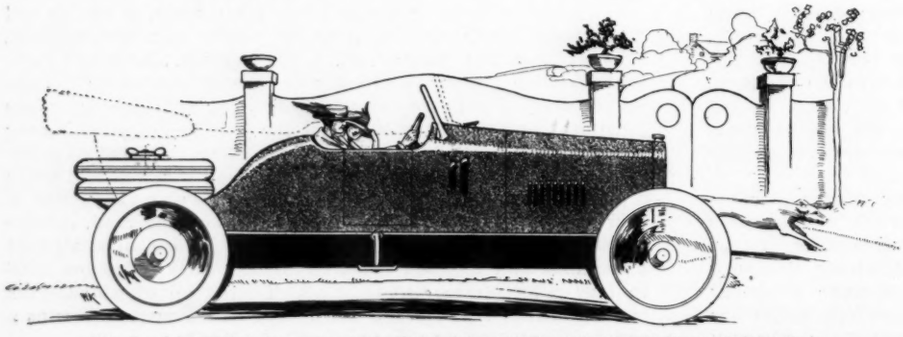


Fig. 7—Suggestion for converting Buick into speedster incorporating straight lines

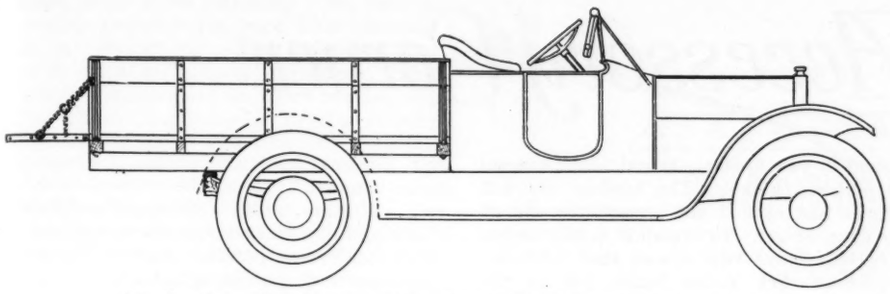


Fig. 8—Suggestion for converting old model Cadillac into delivery car

alignment is correct. Otherwise the car will steer very hard and be tricky on turns. Get plenty of weight over the rear axle. It happens occasionally that too little weight on the rear wheels causes the latter to slip and where a car is traveling at 40 m.p.h. it should be running 50 or more at the rate wheels are going.

One good carbureter properly installed and adjusted should be as good or better than two carbureters on this engine. Matters of this kind are subject of experiment and no two cars perform alike. Hundreds of dollars are spent in experimental work on race cars to get the fitments that seem to give the best performance. It is therefore hard to advise anyone rebuilding a car just what should be done.

Rebuilding Scripps-Booth for Speed

Q.—I am thinking of converting my 1916 Scripps-Booth into a sport car and would like to increase its speed a little. Would like to change into sixteen-valve overhead, if possible.—C. J. Marshall, Memphis, Tenn.

As a general thing it is quite a difficult matter to advise an owner just what to do to make his car faster, so much depends on the condition of the car, speed desired, etc. Some cars by nature of construction are easier to convert into a sort of semi-racing car than others. If a man wants to go in solely for speed it would be better to design a car from the ground up, but where a little more agility is wanted an owner can do considerable in doctoring his mount.

We do not see how you are going to be able to change this engine into a sixteen-valve affair without great expense. You might take up the matter with the Laurel Motors Corp., Anderson, Ind., which concern makes a sixteen-valve head for Ford cars and G. B. S. engines. There is no question but what you would get greater speed and better car performance with a sixteen-valve head. The next best thing would be to bore out the present valve ports and fit larger valves. This allows the gas to enter the combustion chamber more readily and also expels the exhaust gases more quickly.

Other things you might try consist of increasing the compression by planing off some of the cylinder head; for quick acceleration lightweight pistons should be fitted, together with lighter connecting rods. The ignition could be set ahead slightly, larger carbureter fitted and the gears in the rear axle changed to give a different ratio. All of these items mean expense and a great deal of experimenting is necessary sometimes to get the best results.

Rebuilding 1912 American

Q.—In many of your sketches showing how to rebuild cars into raceabouts you depict them with individual molded fenders. I am going to rebuild an American 30 and would like to know where I could get a set of these fenders for 37 by 4 wheels. I want them with very little clearance and some method of attaching them so they will move up and down with the wheels.

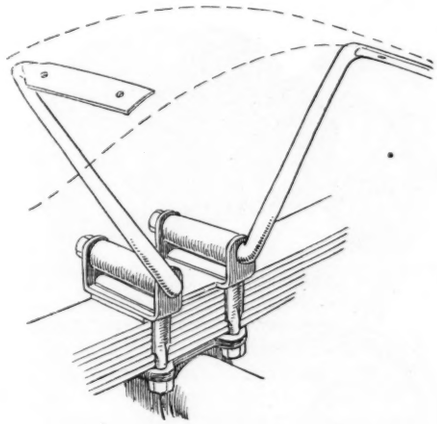


Fig. 9—Suggestion for putting movable fenders on American

2—I find that when the weight of the heavy body is taken off the frame the back springs bow up so that the frame touches the back axle. How can I overcome this? Would you advise taking a leaf from the rear springs?

3—For fast road work would taping the springs heavily have the same result as Hartford shock absorbers?

4—Will an American 1912 30 stripped and in the pink of condition make 60 m.p.h with 16-48 pinion and gear with 37 by 4 tires? The motor is a T-head with single ignition magneto. Would the added efficiency obtained through a double spark magneto pay me to get one?—T. Roberts, Ottawa, Canada.

These fenders are in the majority of cases specially built. If you want the plain flat type of fender, any tinsmith can make them for you, finishing the edge with ¼-in. wire, rolled in. If the molded type of fender is desired, it is best to have them made up by concerns specializing in this kind of work. Such fenders have to be hammered out by hand over wooden or metal forms and the job is a tedious one. If you write to some of the concerns advertising in MOTOR AGE, who make a specialty of rebuilding bodies, fenders, etc., you should be able to get just what you want.

It is more or less of a difficult job to make the fenders so they will rise and fall with the wheels, but a suggested method is shown in Fig. 9. In this case the fender brackets have been attached to a plate covering the spring clips, as shown. The brackets are held in lugs with a nut on the end to draw the whole mechanism up tight. A spacer or piece of tubing should be put in between the lugs, so the latter will not be forced in too much. The same construction might be used for the front of the car. However, the fenders would not turn with the wheels. This would not matter a great deal as most of the running is done with the wheels of the motor car in a straight line.

2—These springs were designed to support a certain load, and naturally when you remove the body they assume a more curved position. The removal of one leaf may help matters some, especially when you fit another body on it, not so heavy as the first. If you wanted to go to some expense you could ship the springs to some spring maker with instructions to make them flatter. Nobody but a competent spring man should tackle the job, as they must be heated and tempered properly. You will find also that flatter springs will ride easier and are very essential to a car used for speed work.

3—No. Tapping the springs is a good substitute when shock absorbers are not to be had.

4—If you can get the engine to turn over about 1600 or 1700 r.p.m. you should be able to get a car speed of 60 m.p.h. We suggest that you bring the engine up-to-date as far as possible by putting on a new carbureter, etc. Whether or not you would gain a great deal with a double spark system could only be determined by trial. As a general thing it would be beneficial.

Making Cadillac Delivery Car

Q.—I own an old model of the Cadillac car, a five-passenger 1913, with electric lights and starter. The mechanical condition of the car is good, but the body and top are somewhat the worse for wear. I have in mind taking off the body and building onto it a platform, equipped with a couple of seats, placing the gas tank behind the seat, allowing space there for a toolchest and accessories box and a tire carrier. Can this be accomplished at a reasonable cost? What changes would be necessary? Could it be done here?

2—Could the steering post be tilted enough to allow of easy handling with the seats lowered?

3—Can you give me the name of some company that does such work, or someone that has plans and specifications of such changes?—Carlo Jorgenson, Minot, N. D.

1—If you do not wish to salvage the body we would suggest that you cut off the tonneau flush with the back of the rear seat. This will save considerable expenses as you will not have to change the angle of the steering post or relocate the gasoline tank. The body post at the rear of the front seat can be used to attach the light delivery body and thus make a fairly presentable job. The sides of the delivery body can be made from 12 by 1 in. lumber with 6 in. side rails set at an angle of 45 deg. The body proper should not overhang the end of the frame more than 9 in. and it would be best to have it flush with the end of the frame, if this will allow plenty of carrying space. This is the least expensive method of rebuilding this car into a delivery car.

2—If you decide to do the work as outlined above it will not be necessary to lower the steering gear.

3—The type of body we refer to is shown in Fig. 8 and this will give you some idea as to how to proceed with the work.

Buick Light Six Speedster

Q.—Publish a sketch of a body, like that of the Marmon 34 speedster shown in the June 7 issue of MOTOR AGE, suitable for a Buick light six, model E-6-49, 1918, using same hood and radiator, with a straight cowl but without headlights, mudguards or running boards. I want a straightline speedster, with slanting windshield and all details like those of the Marmon 34. The hood in this sketch should be made rather long, as the Buick company makes its hoods rather long.—T. T. Beynor, San Antonio, Texas.

A suggestion for this car converted into a speedster according to your requirements is shown in Fig. 7.

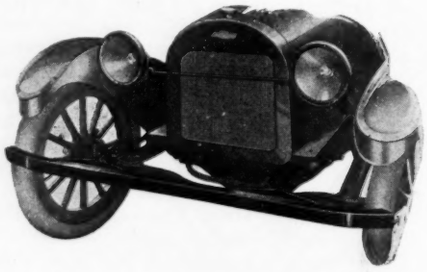
The Accessory Corner

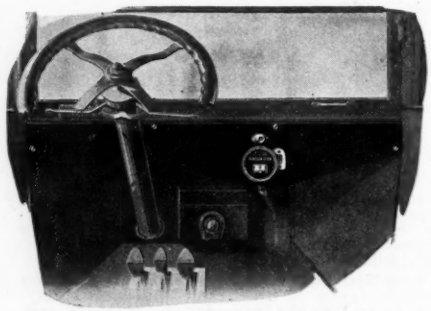
Ti-Re-Pair Outfit

THE new type F equipment of Tip-Top Ti-Re-Pair outfits has larger cavities and a reducing shell so that two popular size tires can be cured at the same time. The equipment is fitted with an inside patch attachment on which practically all sizes of inside work can be handled. Each is equipped with a set of bead molds either straight-side or quick detachable made in a fifth circle only. A self-contained source of steam supply is included. The device is fitted regularly with gas burner. Gasoline or coal oil burners are furnished at slight additional cost. Sizes of cavities are 4½-5 and 3½-4 in.; reducing shell, 2½-3 in.; inside patch attachment, 3½-4 in.; bead molds, 2½-3, 3½-4, 4½-5. Price, $180.—Akron Rubber Mold & Machine Co., Cleveland, Ohio.

New Stewart Products

The new Stewart instrument board for Ford closed cars is made of wood with black eggshell finish. The speedometer is mounted flush with the board and is set off with a flush nickel bezel. It is easy to install a headlight switch, starter control, clock, priming device or other accessory, and it is not necessary to do any cutting or drilling to install the board. A hooded electric light is installed complete with wiring ready for connection with Ford lighting system. The speedometer furnished with the outfit is of the regular Stewart magnetic type with 60-mile dial, 100,000-mile season register and 100-mile trip register with reset device. The Stewart Autoguard for Chevrolet cars is the other new device. It is furnished with special bracket for installation. The device has five principal parts, channel bar, springs and brackets, or connecting members. The channel bar is made of high-carbon steel and is furnished in two finishes, bright black enamel or polished nickel. The springs are full elliptic and extend out toward the end of the channel bar. To install it is only necessary to remove two screws that hold the fender bracket to the frame, put on the special bracket and replace the screws with the two longer ones furnished. A hook bolt engages the lower flange of the car frame channel. Prices: Instrument board, $15; Western, $15; Autoguard, black enamel, $7.50; Western, $8.25; nickel-plated, $8.50; Western, $9.25.—Stewart-Warner Speedometer Corp., Chicago.





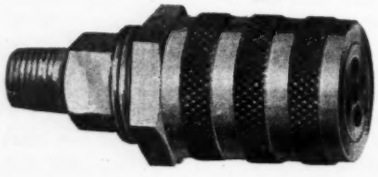
Stewart Autoguard for Chevrolet, above, and instrument board for closed Fords

J. H. Tonneau Shield

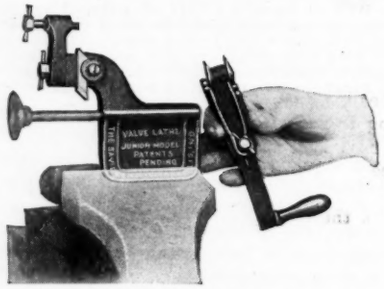
The J. H. tonneau shield consists of a main frame with two folding wings, fitted with fine quality glass. A removable waterproof apron hangs from the bottom of the shield when in use, affording complete protection from underdraughts and keeping the robes dry and clean. When not in use, the apron folds over the shield out of the way. The shield is mounted on a pair of extending steel arms, which are attached to a pair of steel body irons securely fastened to the frame of the front seat beneath the upholstery. The arms are rigid with no projection to tear the clothing. A simple turn of the heads which attach the shield enables you to draw the shield back and fasten it rigidly upon its main support. Once raised, a simple push or pull enables you to open or close the shield and place it in any position desired, where it is held by the friction and locks. The shield can be placed in any position, close for complete protection or farther forward for partial protection. The side wings work by friction to any angle desired. You simply turn them as you would turn a door or shutter, and they stay, it is claimed. Placed at an angle they deflect the wind. When not in use the shield folds against the back of the front seat, taking no more room than a robe. Tonneau Shield Co., 1781 Broadway, New York.

Hercules Lock

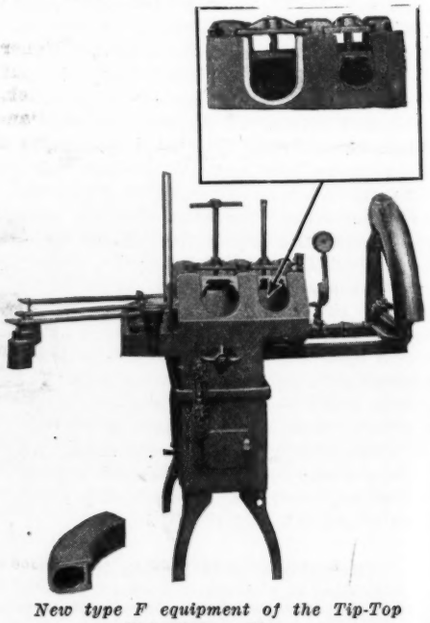
The Hercules lock consists of a 1$\frac{5}{16}$-in. Hercules wire rope 48 in. long and covered with a leather housing. In each end of the rope is spliced securely a galvanized thimble through which the shackle of a padlock



Economy vapor plug, above, and Miles stand for Ford engines



Savidge Junior valve lathe for Fords, above, and universal type



New type F equipment of the Tip-Top Ti-Re-Pair outfits

passes, making the fastening. The leather covering prevents the rope from marring the car or rattling. The locks are furnished with or without a padlock. The padlock furnished is an extra strong, all-brass, six-tumbler lock.—A. Leschen & Sons Rope Co., Hamilton and Kennerly avenues, St. Louis, Mo.

Champion Truck Attachment

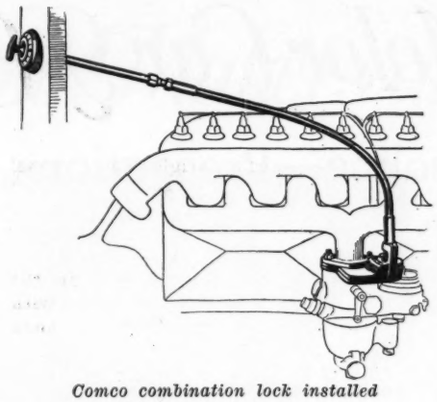
The Champion truck attachment is for converting Ford cars into 1½-ton trucks. The unit is substantially made with four cross members to make the frame very rigid. The axle is 2 5/16 square with 2⅛-in. spindle. The carrying capacity of 3000 lb. permits of an overload. The frame is 168 in. long and 32 in. wide with 4-in. channel-steel construction. Side springs 2½ in. wide, 44 in. long and ten-leaf, with helper springs 2 in. wide, 30 in. long and nine-leaf, are fitted. Attached to the Ford, a wheelbase of 125 in. is given. Other specifications include 4-ton Bock bearings; heavy artillery wheels with 2-in. square spokes; Goodyear solid tires, 32 by 3½; emergency brakes on rear. Loading space is 9 to 12 ft. back of seat, depending on size of body. The weight of the Ford and attachment is 2000 lb. Price, $350.—Champion Potato Machinery Co., Hammond, Ind.

Bench Valve Lathe

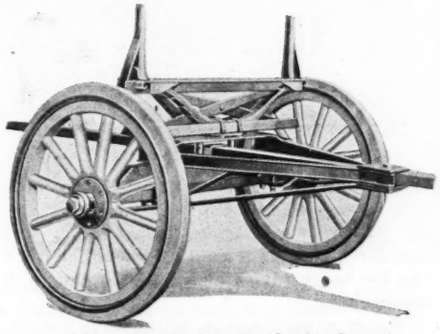
The Savidge universal valve lathe is made for any size valve head. It is furnished with two steel sleeves, one for 5/16 valve stem and one for ⅜ valve stem. Additional sleeves for odd-size valve stems can be furnished. Each lathe has a high-speed steel cutter ground ready for use. The Junior is made specially for Ford valves or any valve with 5/16-in. stem. It is light and compact and easily clamped in a vise, or it can be held in one hand and operated with the other.—Savidge Co., Indianapolis, Ind.

Economy Vapor Plug

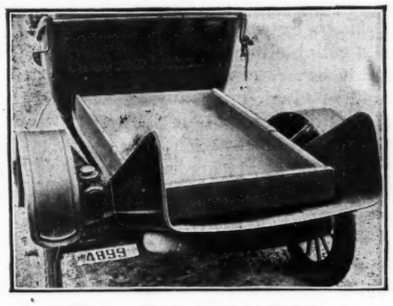
The Economy vapor plug is an auxiliary air valve and is attached to the intake manifold. The device is adjustable to obtain the maximum results from an engine, and once it is installed it works automatically without further attention. It will take in but little air at low speeds and will draw additional air as needed at higher speeds. This is done automatically without attention on the part of anyone. To attach, an 11/32-inch hole is drilled in the intake manifold just below the spread. This hole is threaded with ⅛-in. pipe tap and the vapor plug then is screwed in. Caution is given to have the drill well packed with heavy grease to prevent filings from dropping into the carbureter. After the plug is attached start the engine and test for suction over air intake holes. If no suction is felt the knurled body is turned to the left and locked; vice versa if the suction is too heavy. The device does not operate if the engine is speeded up while it is disengaged and the car is standing. The car has to be driven at increased speed to create increased suction. Price, $3.50.—Aristos Co., Warren, Ohio.



Comco combination lock installed



Adjustable Trailer-Truck attachment



Murphy disappearing truck body

Comco Lock

The Comco combination lock cuts off the supply of gasoline vapor, preventing the starting of the motor and locking the car in place. A dial is within easy reach on the dash board. The device is placed between the carbureter and the intake manifold coupling. The combination can be changed at the will of the owner and can be operated in the dark, as it is not necessary to look at the numbers to open lock. Installation requires no special tools. Price, $10.—Combination Auto Lock Co., St. Louis, Mo.

Disappearing Truck Body

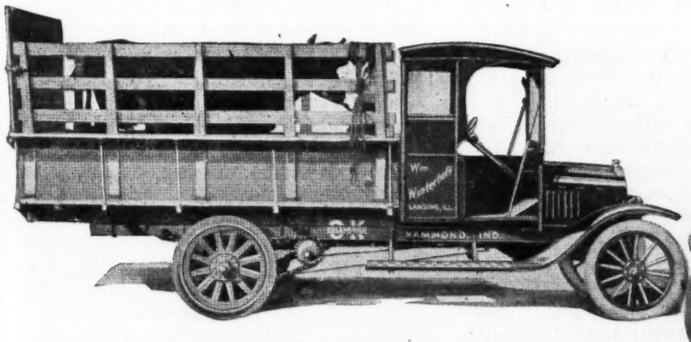
Through the design of the Murphy disappearing body a Ford car can be transformed from a truck to passenger and vice versa at will. As the illustration shows, an apron-like cover swings forwards or backward to bring about the transformation. The device is that of C. L. S. Holmes, Boston Block, Minneapolis, Minn.

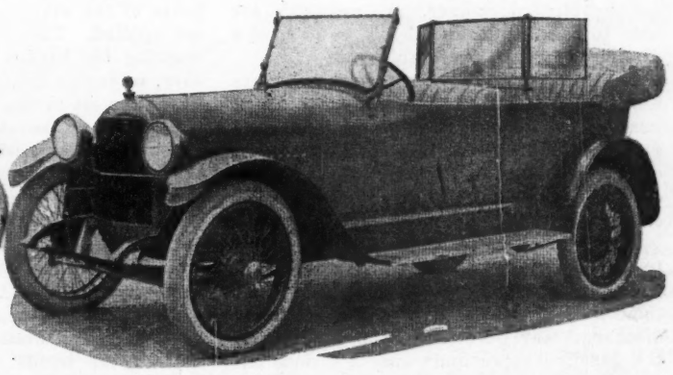
Adjustable Trailer-Truck

The Trailer-Truck is an attachment which permits the economical delivery of both large and small loads. When a small load is to be delivered the unit is detached and the truck departs alone. On the truck's return the Trailer-Truck may have a 20- or 40-ft. load waiting for delivery by replacing the attachment, backing under the load, etc. Three models are offered, 2-ton, 2½-ton and 5-ton capacity. The frames are of heavy steel; springs, heat treated and oil tempered; and wheels, wooden. Timken roller bearings are fitted.—Trailer-Truck Co., Nashotah, Wis.

Miles Engine Stand

The Miles stand for Ford engines is designed as a combination truck for hauling the complete engine about the shop and for dissembling and assembling. Two rollers of caster type and two plain are fitted. By throwing a small lever at one end the casters are lifted and the stand becomes stationary. The cylinder head and transmission cover are removed with the engine in the position as it comes from the chassis and then it is inverted and the brackets slid under the block. This permits the complete dissembling. Price, $35.—E. J. Miles & Co., Newton, Iowa.





Above—Champion truck attachment for Ford cars

Right—J. H. tonneau shield in place on touring car

The Motor Car Repair Shop

Gas and Gasoline—Precautions for Handling

IT is extremely dangerous to run a motor car engine or other gas engine in a small building and have it exhaust into the same air that the people in the building breath. Numerous fatalities have been attributed to people being poisoned by the exhaust gas discharged by a gas engine when running in a small garage. An internal combustion engine idling at a low speed will throw off over 13 per cent of the exhaust as carbon monoxide gas. This gas is not suffocating gas like carbon dioxide but is an extremely poisonous one. Therefore it is obvious that when anyone is working in a small garage with the engine running, the doors of the garage should be kept open at all times so that the air in the garage will be changing constantly and thus avoid the accumulation of the deadly carbon monoxide gas.

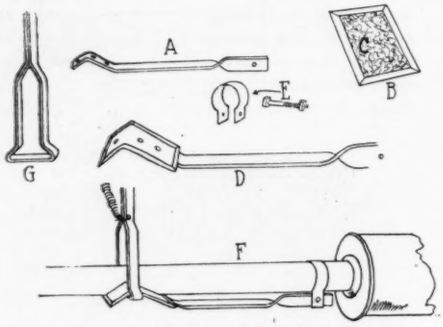
Some garages use a flexible pipe of sufficient length to reach outside of the building and when an engine is running this pipe is slipped over the tail pipe of the muffler and thus all the exhaust gases are conveyed to the outside of the building. In large repair shops of modern construction the supporting columns through the building are made hollow with the openings near the floor. The heavy gases are carried away, first, due to the draft created by the height of the column which performs the same function as a chimney. The exhaust gases from the running cars also may be carried to the columns by flexible tubing and thus carried away to the outside air through the column.

Store Underground

It is preferable to store gasoline in underground tanks. If it is stored on the surface the tank should be placed in a well ventilated place so that there will be no accumulation of gasoline vapor. Open fires like lighted pipes and cigarettes should never be permitted near a gasoline storage tank, as there is danger of any vapor that may be present being ignited. All electric lamps should be guarded so that the possibility of a flash is reduced to a minimum. Gasoline should not be permitted to stand around in open cans but should be returned to the supply tank. Many fires in garages have been traced to a partially filled can which some one carelessly left standing in an unprotected manner. All cans that are used to handle gasoline should be painted a distinctive color, preferably red.

It is a good policy in a garage to use kerosene for cleaning purposes instead of gasoline, as this is cheaper and less dangerous. More accidents are caused by an open fire or some one smoking while a tank or can is being filled than from any other cause.

In transferring gasoline from one vessel to another there is danger of static electricity being generated. If this occurs and the container is not grounded, the electrical discharge may be strong enough to ignite the gasoline vapor and cause a serious explosion. To prevent this the containers should be grounded to check the accumulation of electricity. Cans should never have handles of wood or be insulated in any manner. A funnel can be grounded to a can by having it attached to the can by a small chain.



Apparatus used by reader installing cut-out

Water should never be used in an attempt to extinguish a gasoline fire, as it only serves to spread the fire, because gasoline floats on water. The best method is to use a reliable chemical extinguisher. Fires of this nature also may be smothered with sand, sawdust or heavy cloths. It is a good policy around a garage to have a bucket of sand for each 2000 sq. ft. of floor area. Chemical fire extinguishers also should be distributed in about the same proportion.

Under no consideration are oily rags and waste to be permitted to lie around the garage. These should be placed in a metal container with a self-closing cover. Some precautions to be observed in the handling of gasoline to prevent the possibility of fires are as follows:

1—Keep open lights away from all gasoline cans or tanks.

2—Use only closed cans for carrying gasoline.

3—Do not let oily rags or waste lie around. Place them in a metal container.

4—To extinguish a fire use a chemical extinguisher or smother the fire with sand. Never use water on a gasoline fire as it spreads the fire.

To prevent the possibility of explosions:

1—Have the storage place for the gasolin well ventilated.

2—Never let gasoline stand around in open cans.

3—Do not transfer gasoline from one tank to another near an open light.

4—Do not spill gasoline.

5—Do not use gasoline for cleaning in a closed room.

To minimize the danger from exhaust of a gas engine:

1—Adjust the carbureter as lean as possible so that the engine will run properly.

2—Pipe the exhaust gases out of the building.

3—Do not work or stand near the exhaust when engine is running.

4—Unless the ventilation is ample provision should be made to have the exhaust gases piped out of the building.

Squeaking Brakes

Many owners have trouble with squeaking brakes. This condition usually is caused by dirt being forced into the pores of the brake lining when the brakes are applied. This dirt can be removed by washing the brakes with kerosene. However, when the lining becomes firm and the bands are set to the shape of the drum, an application of kerosene will not cure the squeaking trouble which seems to be one of the characteristics of some makes of cars. A very good preventive is to mix a small amount of resin and castor oil so that the mixture is a fluid and then apply a small amount of it to the brake bands. This invariably will stop brakes from sqeaking.

The owner-driver should be very careful to see that his brakes are well lubricated so that the bands will not drag on the drums.

Home-Made Cut-Out

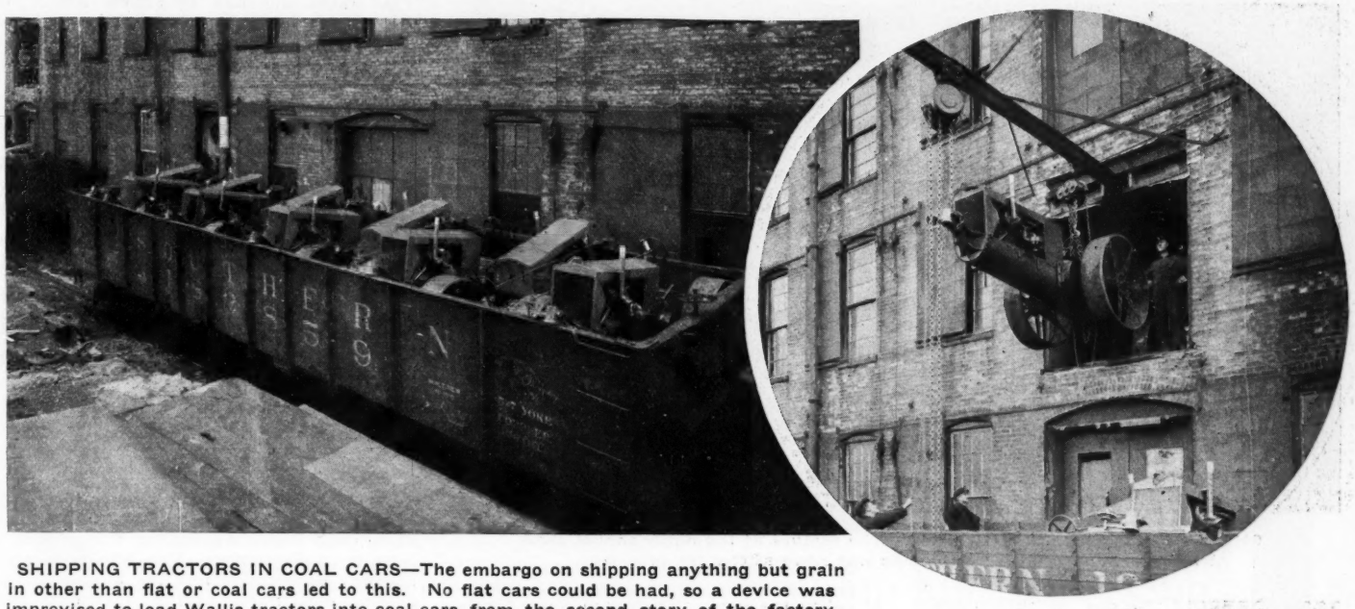
North Loup, Neb., Editor MOTOR AGE—Many of the new cars are not equipped with a cut-out, and for individuals who prefer such equipment I am inclosing sketches of a device which works well and requires but a short time to install.

First, a V-shaped vent, at the angle shown, is cut into the under side of the exhaust pipe and the edges smoothed off with a file. A length of strap iron 16 in. long and 1 in. wide, of good weight, is then bent to the form shown in A and corresponding holes bored. This is the rocker arm.

Now a piece of heavy sheet iron or steel is cut about 6 in. long, 4 in. wide and the corners cut out ¼ in., with the edges turned up. After a piece of non-inflammable heavy gasket material is cut to fit snugly into the iron pan, the edges are turned down, holding gasket snugly. Holes then are bored as shown and the rocker arm bolted on. The bend in the strap iron rocker arm must be of the same angle as the cut in the pipe and when the pad and arm are assembled must fit the notch snugly, when the hose clamp is placed over the pipe and the fulcrum end of the rocker arm attached thereto.

The valve is regulated by the foot. Any suitable projection will do, allowing it to protrude through the floor of the car.. It is connected by strap iron, bent as shown and bolted to the under side of the valve. Since there is a slight variation of the angles of the open and the closed valve, the bolt hole through the bottom of the stirrup should be elongated in the direction of the run of the pipe and the bolt allowed a bit of play. A coil spring attached to the under side of the floor closes the cutout.—D. R. Van Horn.

Among the Makers and Dealers



SHIPPING TRACTORS IN COAL CARS—The embargo on shipping anything but grain in other than flat or coal cars led to this. No flat cars could be had, so a device was improvised to load Wallis tractors into coal cars from the second story of the factory

HAYES with Canadian Overland—Frank A. Hayes, formerly engineer with the Willys-Overland Co., Toledo, Ohio, has been appointed chief engineer of the Willys-Overland, Ltd., Toronto, Ont.

Limbach Becomes Equipment Engineer—Henry C. Limbach, former production manager of the Zenith Carburetor Co., Detroit, is now equipment engineer of the Strong, Carlisle & Hammond Co., Detroit.

Freeman with Wilson Body—G. A. Freeman has resigned as vice-president of the J. C. Wilson Co., Detroit, to become associated with the C. R. Wilson Body Co. in the airplane body division. Mr. Freeman has been succeeded by Andrew Lehr, formerly connected with the Studebaker and General Motors interests.

Winther Truck to Build Now—Ground will be broken at once for the new $125,000 plant of the Winther Motor Truck Co., Kenosha, Wis. It is planned to have the shops ready for operation by May 15 or June 1. The company is manufacturing trucks at Winthrop Harbor, Ill., just south of Kenosha, but has accepted large contracts for Army trucks, and this made it advisable to carry out the original intention of M. P. Winther, founder of the company, to become established in Kenosha, which has been his home for years. The new factory will be of steel, brick and concrete, 150 by 450 ft.

LaCrosse Dealers to Ask Cash—The LaCrosse Automobile Dealers' Association, LaCrosse, Wis., has adopted rules for a strictly cash business basis. Members will be required to make all customers pay cash for repairs, accessories, supplies, gasoline, oil, etc. It was agreed by all that unless a strictly cash basis were adopted it would be necessary to raise all prices. By accepting the alternative, the expense of bookkeeping, collections and other incidental costs arising out of a credit system is eliminated and the association has fallen into line with the progressive dealers' organizations all over the country. Every dealer in LaCrosse has on hand from fifteen to twenty less cars than at the same time last year. The demand for both new and used cars is reported exceptionally keen. Dealers are advising their patrons that the supply of gasoline is not only larger than normal but promises to be well maintained, while there is every indication of a serious shortage of cars.

First Returns for Alter Made—The Detroit Trust Co., trustee for the Alter Motor Car Co., Plymouth, Mich., is distributing an initial 10 per cent to creditors, realized on the sale of the property. Liabilities were $25,000, and it is expected the creditors will receive not more than 25 per cent.

Walker Leaves Packard for Wire Wheel—Clarence S. Walker has resigned as patent counsel of the Packard Motor Car Co. to become associated in the same capacity with the Wire Wheel Corp. of America, Buffalo, N. Y. Mr. Walker was for seven years assistant examiner in the United States patent office at Washington previous to his connection with the Packard company.

Burke Buys Electric Service—D. W. Burke has bought out and will operate the Auto Electric Service Corp., Detroit. The concern is the official representative and service station for the Bijur, Auto-Lite, Dyneto, Westinghouse, Eclipse Bendix, Tillotson carbureter, Heinze-Springfield Ford starter, Atwater-Kent, Berling, Connecticut, K-W ignition, Philbrin, and Norma Bearing companies. D. W. Burke was formerly superintendent of motor car service of the Westinghouse Electric & Mfg. Co., Pittsburgh.

Reo to Force More Driveaways—The Reo Motor Car Co. is turning out sixty motor trucks and eight passenger cars a day. The factory is working 24-hr. shifts. Practically all shipments are sent to the Middle West and East. Two-thirds of the production is driven away. Twenty trucks left for Boston and thirty for New York left last week. It is planned to send no trucks east by freight; all going in this direction will have to go under their own power. The passenger cars have the biggest sale in the Middle West and South. The oldest dealer of the company, located in Boston, reports that his sales the last week exceeded all previous records; he sold eight and ten a day. The company proposes to place an embargo on its product and will refuse to ship to dealers within a certain radius. This will force the dealers situated within the prescribed limits to drive and will do much to make available more freight cars for more distant shipments.

Morris to Manage Savage Tire—Raymond V. Morris has been appointed general manager of the Savage Tire Co., San Diego, Cal. He formerly was connected with the Curtiss Aeroplane & Motors Co., Buffalo, N. Y.

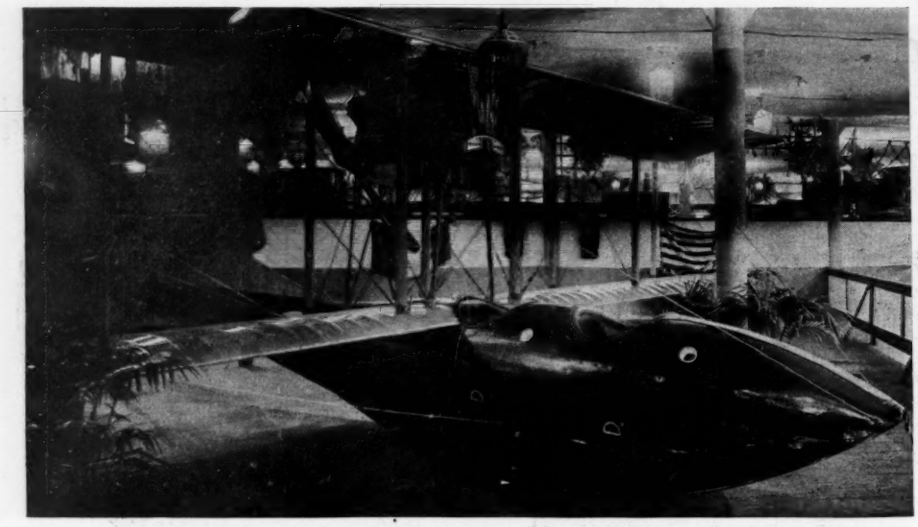
Dobson to Manage Standard Factory—E. W. Dobson has been appointed factory manager of the Standard Motor Truck Co. Mr. Dobson was formerly in charge of the truck department of the Packard Motor Car Co. and later was connected with the Continental Motor Co. and the Hercules Motor Co.

Fitch Heads Detroit Branch—N. J. Fitch has been appointed manager of the Detroit branch of the Bearing Service Co., Detroit, succeeding E. G. Volker, who has been promoted to be manager of the New York branch. Previous to coming to Detroit Mr. Fitch was assistant manager of the Bearing Service Co. at Cleveland, Ohio.

Innes Is Transferred to New York—H. L. Innes, factory manager of the Chevrolet Motor Co. for the last year, has been transferred to General Motors headquarters in New York. Thomas Houghton, formerly with the Durant-Dort Co. and later with the Dominion Carriage Co. of Toronto and the Tarrytown plant of the Chevrolet, will succeed him at Chevrolet.

Racine Tire Increases Output—The Racine Auto Tire Co., Racine, Wis., has completed the removal of its factories to its new plant, consisting of the large factory group of the former Fish Bros. Wagon Co., which affords a total of 250,000 sq. ft. of floor space. The group covers an area of 350 by 500 ft., and the buildings range from two to four stories in height. The output already has been increased from 500 tires a day to more than 1000 and within a short time will be increased further to 2000 a day. Its volume of business last year exceeded $2,000,000. Officers of the company are: President, Lucius J. Elliott; vice-president, J. H. Wright; secretary-treasurer and general manager, Clarence Wright.

From the Four Winds



SHOW CHRISTENS FLYING BOAT—The feature of the ninth annual show at Grand Rapids, Mich. The plane was named after the president

23,229 DETROIT Trucks in 1917—Detroit plants produced 23,229 trucks in 1917 at an approximate market value of $45,462,000. The total production of Detroit and Flint, Lansing and Alma aggregated an approximate market value of $60,962,000.

No License for Wisconsin Driveaway—To assist motor car manufacturers as much as possible in facilitating driveaways during the freight traffic congestion, the Wisconsin legislature has passed a law making it unnecessary for factories to provide license numbers for each car while it is being transported from the place of manufacture and the place of business of the dealer. A large saving to manufacturers and dealers is thus effected.

To Stop "Borrowed" Car Nuisance—The Detroit Automobile Club is taking steps to put a stop to the frequent practice of employees taking cars out of garages without the consent of the owners. Public garage owners will be asked to co-operate with the club to the extent that they warn their employees not to take out cars left for storage over night. Placards giving a warning and quoting the law will be prepared and distributed among the garages of the city, or at least to those places where the owners agree to put up the signs. The law provides for exceptions left to the discretion of the court. A fine of $200 or two years in prison are the maximum penalties.

Comparative Cost of Car and Horse—Congressman Burns of Tennessee in discussing appropriations for the purchase of a car for the Postmaster General stated "all cabinet members are now provided with four horses and two to four carriages and it is a matter of economy to have an automobile instead of the horses. These horses cost from $30 to $35 a month each for board, in addition to stable hire, and the repair of the carriages and the cost amounts up. An automobile was authorized a year ago for the Secretary of State and the actual facts show as reported by the Chief Clerk of the Department of State that that automobile has cost $1,000 less to the Government during the year than the horses and carriages."

Hartford Show About Ready—Practically all space has been sold for the annual Hartford, Conn., show which is to be held March 30 to April 6. Nearly all the dealers arranged in December for special cars for the show, which originally was scheduled for the week of Feb. 16. The exhibition this year includes a truck section in the basement of the armory.

Buick Feast for Departing Workers—Employees of the Buick Motor Co. gave a banquet as a farewell demonstration for thirty-five fellow workmen who will enter Government service, in which more than 300 men participated. Chief among the speakers were Walter P. Chrysler, president and general manager of Buick; Charles S. Mott, vice-president of General Motors Co.; and Melzor C. Day, acting managing director of the Flint, Mich., board of commerce.

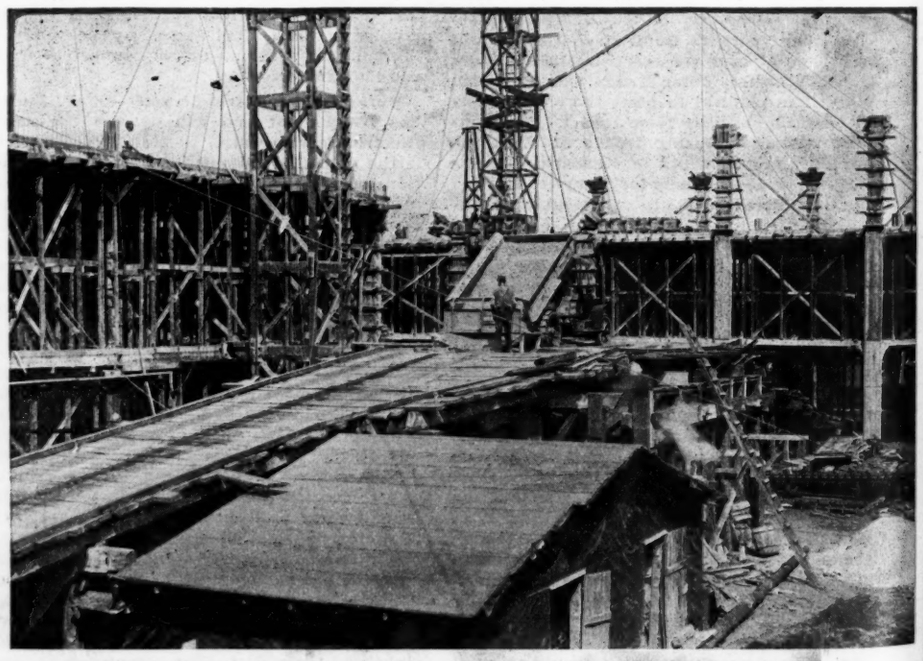
Michigan Roads Meeting in September—The postponed annual meeting of the Michigan State Good Roads Association will be held at Detroit in September. The Michigan state highway department and the highway engineering department of the state university will promote important instructive features. The completion of the good roads system in Michigan will be considered and a tour of the highways of Wayne County will be a feature of the meeting.

Tractors for Boys' Summer Camps—Boys attending the Y. M. C. A. summer camp at Elmdale, Kan., this year will receive training in more useful pursuits than the ordinary fishing, games and study which always have been the accepted courses of study. They will be given instruction in how to run tractors as well. Arrangements are being made with manufacturers of tractors and implements for demonstrations at stated periods during the summer camp, which begins May 28 and continues all summer.

Coming Motor Events

SHOWS

March 20-23—Trenton, N. J.
March 20-23—Holdredge, Neb.
March 25-30—Rochester, N. Y.
March 30-April 7—Chicago.
April 1-6—York, Pa.
April 5-8—Green Bay, Wis.
April 9-13—Stockton, Cal.
April 9-13—Parsons, Kan.
April 16-20—Savannah, Ga.
April 16-20—Deadwood, S. D.



TRUCK HELPS BUILDING OPERATIONS—A specially constructed loading and unloading platform speeds up the work of this White truck on construction